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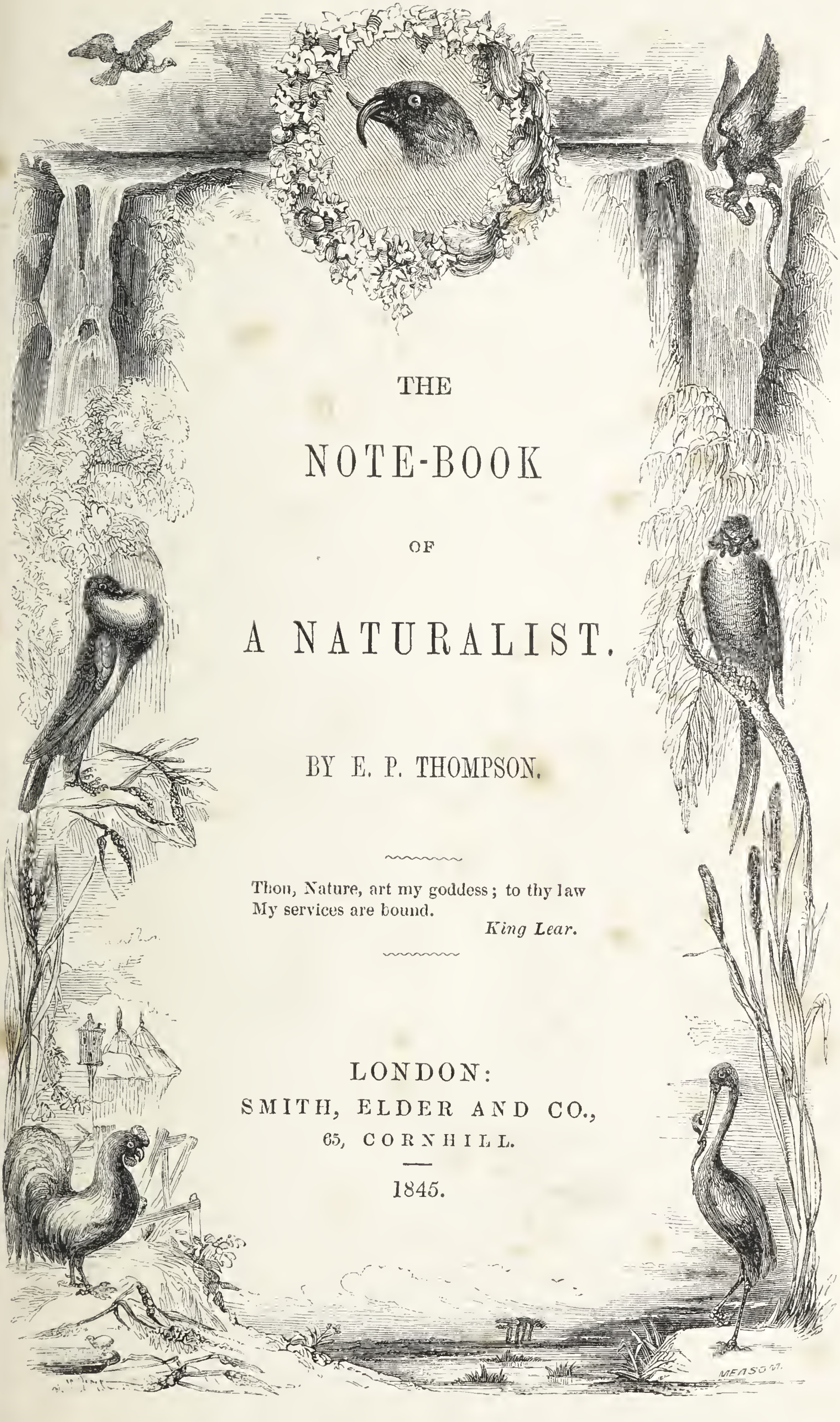

THE

# NOTE-BOOK
OF
# A NATURALIST.

BY E. P. THOMPSON.

> Thou, Nature, art my goddess; to thy law
> My services are bound.
>
> *King Lear.*

LONDON:
SMITH, ELDER AND CO.,
65, CORNHILL.

1845.

London:
Printed by Stewart and Murray,
Old Bailey.

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TO THE

INHABITANTS OF HIS NATIVE TOWN,

TO WHOSE KINDNESS AND GOOD FEELING

THE AUTHOR IS INDEBTED

FAR BEYOND HIS POWER TO EXPRESS,

**This Volume**

IS MOST RESPECTFULLY AND

AFFECTIONATELY DEDICATED.

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# INTRODUCTION.

There are many practical and zealous florists who are ignorant even of the elements of botany, and there are equally as many ardent followers of Natural History who derive both amusement and instruction from its pursuit, without cultivating it as a science. The knowledge of the various genera, their classification, their habits, the period of their appearance, is, whether applied to ornithology or entomology, no slight task, although, with perseverance, not difficult of attainment.

In these branches, from the comparative facility of obtaining specimens, the amateurs are the most numerous; and how many have succeeded in forming private collections, perfect almost as regards the British species!

The consequences of this pursuit, when not even carried to the length of a study, are self-evident, and the day has happily passed away in which the votaries of nature were taunted with ridicule, and as addicted to childish fancies. There is a kind of freemasonry in the study or pursuit of Natural History; it operates on our kindly affections, and in many instances opens the communication to the most pleasing acquaintances, which, from congeniality of disposition, ripen into the warmest friendships. Our walks cease to be solitary, something there is always to observe, something to note down, to verify, or compare. The effect on the mind, too, is not one of its least advantages: we look round on the creation, and exclaim with Stillingfleet:—

> "How wondrous is this scene! where all is form'd
> With number, weight, and measure! all design'd
> For some great end!"

We admire with astonishment the Providence which has assigned to each thing its place, forming an harmonious whole, through such innumerable and inseparable links; and feel, with deep humility, how richly we are endowed, and how great is our debt of gratitude and praise to nature's God. From casual observance in the first instance, we are led on to serious contemplation, and higher feelings are awakened, which operate most influentially on the mind and conduct. I have ever noticed as a sequence, that kindness of disposition, consideration for others, and a greater calmness of mind, become the portion of the admirer and observer of the works of Providence: he rises from the perusal of the book of nature a better man.

As a traveller through a considerable portion of Europe, I have experienced the kindest attentions from people, to whom I had not even letters of introduction, and of whose existence I was not previously aware, but who, as kindred spirits, met my inquiries and curiosity with unaffected welcome and cordiality, giving me in many instances solid proofs of their good-will, by forcing on me some specimen or some object, which probably had formed the matter of inquiry. Thus at Abo, on the Gulf of

Bothnia, the master of the house at which I was staying, for there are no inns, in return for my having taught him how to skin birds, at which he was not sufficiently an adept, sent his son with me in a boat to a spot at some distance to assist me in procuring a specimen of the crested titmouse; but having failed, although the bird is common in that district, he set me up with a nest of the eggs from his own collection, together with those of the cock of the wood, the eider duck, and many others hardly procurable, if at all, in this country.

My taste for Natural History began so early in life, that I can only remember my first efforts, as a mere child, to form a collection of insects. A few pill boxes, one being appropriated to each specimen, comprised my cabinet, and I believe I shall never forget to my latest day my despair at not being able to accommodate a huge dragon-fly in one of those repositories. My crude ideas were, however, soon destined to assume a more perfect form, for on being sent to Germany for my education shortly after the peace, I had the most abundant opportunities of collecting and of arranging my specimens methodically. The result was, that I formed a very perfect cabinet of the Lepidoptera of that country, and laid the foundation of one in ornithology, which in after life, as regards British birds, I had the satisfaction of nearly completing.

It has been my habit to keep a kind of journal of those matters connected with Natural History which have fallen under my observation, with the additions of such anecdotes as I have heard or been connected with: these notes are slight and loosely put together, and were intended originally for my own gratification and reference, but a momentary lull having occurred in a life otherwise passed in active pursuits, I have fallen back upon them, as the means of occupying an occasional vacant hour, and in the humble hope of contributing my mite to the inexhaustible stores of amusement which the subject contains.

I am indebted for some passages in the following pages to works I have read, but as the insertion of them took place nearly ten years ago, I am unable at this lapse of time to recall the sources in all instances, therefore where I have failed in acknowledging them, it has been without the wish of pirating the beautiful and original ideas which then attracted my attention.

E. P. T.

*May* 1, 1845.

# ESSAY

ON

# NATURAL HISTORY.

The advantages arising from a study of natural history are so important, that we cease to wonder, that men possessed of great mental powers and discernment, should have devoted their time and attention to endeavour, by promoting the knowledge of its various branches, to add to the comfort and happiness of their fellow-men. Towards the extension of this most desirable object, costly libraries and well-stored museums have been established, and now grace our principal towns; and without such aid how could we hope to investigate, or become in the slightest degree acquainted with any portion of the 80,000 species of living beings already described, the thousands of others known to exist, and the tens of thousands which in all probability remain to be discovered. In a national point of view the benefits are incalculable, since from one branch or other of this science, our food, our clothing, and every domestic convenience are derived,—commerce is extended, and daily discoveries add to its increase; civilization is promoted, and the intercourse of man placed on a more friendly, and, consequently, on a firmer footing.

There is a peculiar interest attached to natural history, even when pursued as a mere recreation, or without any view of benefiting others by our observations. The charm which it throws on a summer's walk, or even on a simple turn in the garden; the habits of quick observation which it excites in the youthful mind, or the expansion it gives to the heart in more mature life,—all these, and many more of its attractions have been enlarged upon and illustrated by able pens. The study of nature is opposed to the study of man chiefly in this respect, that the first presents everything that is lovely and of "good report," while the latter is continually bringing before us, fraud, duplicity, violence, and all those passions which, without being imbibed, insensibly blunt our better feelings. But if these arguments fail, and people will only be induced to take an interest in things which affect their immediate comforts, it will be found that some acquaintance with natural history is not only useful, but sometimes essential to a large portion of the community. There is no one class in whose success the interests of mankind are so much involved as in that of agriculture. By this is meant, that as food is the first necessary of life, every question which concerns its production deserves very serious attention. It is well known that some unexpected failure of crops takes place every year, originating from the depredations of the insect world; that the labours of the farmer, and the hopes of the planter are continually destroyed by these minute and subtle enemies, and that local scarcity, and often individual ruin, is the sad result. With these evils upon record, and coming under our notice in one form or other every year, it would be imagined that that portion of natural history at least, which related to agriculture, planting, and gardening, had been well studied; that books had been written on the subject; that the history and economy of all these insects had been investigated, and that effectual means had been pointed out for counteracting their injuries; but what is the true state of the case? Incredible as it may appear, this subject has been almost entirely neglected. No work professing to give the agriculturist a right knowledge of the animals useful or injurious to him exists in our language. If further proof were wanting, it may be only necessary to state that the Earl of Hardwick lately offered a premium of twenty-five guineas for the best essay on the turnip-fly, its prevention and destruction.

Every admirer of nature must however rejoice to see that natural history has assumed an importance in this country, within the last few years, which it had hitherto never been thought to possess, and that its cultivation is now spreading with a zeal and rapidity quite unexampled. It behoves every one to view nature in her true garb, and to contemplate the innumerable ways by which Creative Wisdom has provided for the wants, the pleasures, and the protection of "every living thing that moveth on the earth." Woods and mountains, plains and valleys, each peopled by their own inhabitants, afford never-failing instruction and delight.

There are few who have not perused the "Natural History of Selbourne,"—a collection of letters on the facts observed by its philosophic author respecting the animals of his native village. Mr. White was a country clergyman, who held little intercourse with the world, and was almost unknown to the scientific portion of it. In truth, he seems to have given little of his attention to system, and still less to learned societies, yet, with all these disadvantages against a short-lived popularity, what book ever published in this country has rendered natural history more attractive, or has, in consequence, been more generally read! We feel interested in the little anecdotes this true philosopher has preserved of every subject which crossed his path, and almost fancy we hear him narrate the incidents of his evening's walk while seated in his own garden hermitage. His style is suited to his subject,—easy, chaste, and natural. He studied nature; and, in recording what he saw, thought it not beneath him to point out that one bird hopped, while another walked; or that the nest of another was built in a low bush instead of being placed in a high tree.

All can remark the beautiful verdure of the fields and woods, the elegance of the flowers, the melodious and delightful singing of the birds, yet few indeed ever give themselves the trouble of proceeding a single step farther, or exhibit any desire of examining into the nature of these great combinations of the Divine Power. It is one of the most material uses of the study of nature, to illustrate this most important of all truths: "that there must be a God, and that he must be almighty, omniscient, and infinite in goodness, and that, though he dwells in a light inaccessible to any mortal eye, yet our faculties distinguish him clearly in his works."

> "These are thy glorious works, parent of good;
> Almighty! thine this universal frame,
> Thus wondrous fair; thyself, how wondrous then!
> Unspeakable, who sitt'st above the heav'ns,
> To us invisible, or dimly seen
> In these thy lowest works; yet these declare
> Thy goodness beyond thought, and power divine."

In these we are compelled to observe a degree of greatness far beyond our capacities to understand:—

we see an exact adaptation of parts composing one stupendous whole ; an uniform perfection and goodness, that are not only entitled to our admiration, but command from us the tribute of reverence, gratitude, and love, to the Parent of the universe. Every step we take in our observations of nature affords us indubitable proofs of His superintendence. From these we learn the vanity of all our boasted wisdom, and are taught that useful lesson—humility. We are compelled to acknowledge our dependence on the protecting arm of God, and that, deprived of its support, we must that moment dissolve into nothing. Every object in the creation is stamped with the characters of the infinite perfection and overflowing benevolence of its author. If we examine with the most accurate discrimination the construction of bodies, and remark even their most minute parts, we see clearly a necessary dependence that each has upon the other ; and if we attend to the vast concurrence of causes that join in producing the several operations of nature, we shall be induced to believe further, that the whole world is one connected link of causes and effects, in which all the parts, either nearly or remotely, have a necessary dependence on each other. We shall find nothing insulated, nothing dependent only on itself. Each part lends a certain support to the others, and takes in return its share of aid from them.

> "How wondrous is this scene! where all is form'd
> With number, weight, and measure! all design'd
> For some great end! where not alone the plant
> Of stately growth; the herb of glorious hue,
> Or foodful substance; not the labouring steed,
> The herd, and flock that feeds us; not the mine
> That yields us stores for elegance and use;
> The sea that loads our tables, and conveys
> The wanderer man from clime to clime; with all
> Those rolling spheres, that from on high shed down
> Their kindly influence; not these alone,
> Which strike even eyes incurious, but each moss,
> Each shell, each crawling insect, holds a rank
> Important in the plan of Him who fram'd
> This scale of beings,—holds a rank, which lost
> Would break the chain, and leave behind a gap,
> Which Nature's self would rue."

If we look around us, we shall find it a very difficult matter to discover an entirely barren spot. If by any devastation such is made, it does not long remain unoccupied. Seeds are soon scattered over it; the downy ones of thistles, wafted by the winds, are the first to take root, and after these come various other plants, till at length the whole space is filled. If a rock is left entirely bare by the receding water, the minute crustaceous lichens in a few years entirely cover it. These dying, turn to earth, and the imbricated lichens now have a bed to strike their roots into. These also die, and various species of mosses succeed; and when after some time a sufficient quantity of mould has been formed, the larger plants, and even shrubs, take root and live.

But all the common operations of nature, surprising as they are, become in general so familiar to us that in a great measure they cease to attract our notice. Thus, also all the usual powers of animal life, which, were they but adverted to, could not fail to affect the mind with the most solemn impressions, are suffered to operate unheeded, as if unseen. We all know, for example, that, whenever inclination prompts us to it, we can, by a very slight exertion of our vital faculties, raise the hand to the head. Nothing seems more simple and easy than this action; yet when we attempt to form an idea of the way in which that incorporeal existence, which we call *mind*, can operate upon matter, and thus put it in motion, we are perfectly lost in the incomprehensible immensity which surrounds us. When we try to investigate these matters, we perceive that by patience and attention we can make a progress in attainments to which, according to our limited ideas, bounds can hardly be assigned. The mind of a Newton can display its superior powers, and soar to a height that exalts it far above the reach of others; and yet, in trying to explain the cause of animal motion, the meanest reptile that crawls upon the ground is, humiliating as the thought may be, on a footing of equality with a Newton: they can alike exert the power conferred on them by the Almighty Creator, without being able to form the smallest idea of the way in which they are enabled to produce these effects. Man, however, can contemplate these effects, if he will; and man, perhaps alone of all the animals that exist on the globe, is permitted, by contemplating the wonders which these unfold, to form some idea of his own nothingness, with a view to moderate his pride, and thus to exalt himself above the unconscious agents which surround him.

A skilful naturalist has been able to perceive that in the body of the lowest caterpillar, which in the common opinion is one of the most degraded existences on earth, there are upwards of two thousand muscles, all of which can be brought into action with as much facility, at the will of that insect, and perform their several offices with as much accuracy, promptitude, and precision, as the most perfect animal. It would be no easy matter to make some men believe that the most minute insect, whose whole life may be calculated for only the duration of a few hours, is, in all parts, for the functions it has to perform, as complete as the majestic elephant, which treads the forests of India for a century. Little do they suppose, that, even in its appearance under the greatest magnifying powers, it is as elegant in every respect, and as beautifully finished, as any of the larger animals. Unlike the paltry productions of man, all the minute parts of these works of God appear in greater perfection, and afford to us a greater degree of admiration, the more minutely and accurately they are examined. M. de Lisle saw, with a microscope, a very small insect, that in one second of time advanced three inches taking five hundred and forty steps, and many of the discoveries of Leuwenheck were even still more wonderful than this.

If, from the contemplation of microscopic objects, we turn our attention to animals, we shall find them calculated in every way, and in the best possible manner, for the climates in which they reside, and for their separate and peculiar modes of life. In the dreary northern regions the dark animals become white, as a prevention to the escape of heat from their bodies by radiation, and to evade, by their resemblance to the prevailing colour of the country, the quick sight of their enemies, and their clothing also becomes during winter nearly double what it is in summer. In torrid climates the sheep loses its woolly fleece and is covered with hair: the camel, that traverses the burning sands of the deserts, is formed with spongy feet, which the heat cannot crack; it has a reservoir of water, which enables it to resist for many days the attacks of thirst, in a country where no water is to be had, and it is contented with browsing on such miserable food as is to be met with in its progress.

In vegetables, again, we observe similar marks of superintendence. Some are Alpine, and can only exist on the summits of mountains, some grow in marshes, others in sandy plains, and each of them is exactly adapted to its particular situation. The plants of the desert are nearly all succulent, and able to bear the privation of moisture for an astonishing length of time. Those that are found on the sea shore could not, in many instances, be retained in their situations, did not their roots become so matted among the sand, or strike so deeply down, as to render them perfectly immoveable by all the shocks they sustain from the wind or waves. It is also a remarkable circumstance that evergreens grow principally in the hottest climates, where they are chiefly found in the otherwise barren woods, thus affording a natural shelter to the various animals from the excessive heats to which they would otherwise be exposed.

Thus does the uniform voice of nature exclaim aloud, that "the merciful and gracious Lord hath so done his marvellous works, that they ought to be had in remembrance." The whole material system throughout heaven and earth presents a varied scene, rich in use and beauty, in which nothing is lost, and in which, as has been before observed, the meanest and minutest creatures have their full designation and importance. Nothing of all these various existences was formed in vain; and that which is, however it may appear to our confined and imperfect comprehensions, is formed with supreme wisdom. It does not become us to pry too boldly into the designs of God. We are unable to judge of the councils of that Providence whose economy regards not the objects merely of our senses, but the whole system of nature. He did not plan the order of nature according to our confined principles of economy. The stupendous performance of the Almighty is one throughout the universe, and if Providence does not always calculate according to our mode of reckoning, it would but become our inferior stations and judgment, instead of industriously seeking out imperfections, to discover that these exist alone in our own erroneous powers of discrimination.

From the preceding observations, it appears that Natural History affords a more extensive moral than would be supposed by a casual observer, and the blind curiosity, which formerly was the principal motive for making collections and studying the science, is now giving way to more noble and estimable ideas; and there are yet, "in the instructive book of nature, many leaves which, hitherto, no mortal has perused." It is evident that the general tendency of the study is to lead us from the admiration of the works to the contemplation of their Author; to teach us to look through nature up to nature's God. It is a study which terminates in the conviction, the knowledge, and the adoration of that gracious and merciful Being to whose goodness alone we are indebted for every happiness we enjoy. The gifts of the Creator are full handed; nor has he always placed it in our power to accept of that which is indispensably necessary, without, at the same time, compelling us to accept of the pleasure that accompanies it.

Of the connection which has, from the earliest ages, subsisted between commerce and intellectual improvement, the records of the human race bear constant evidence. The perfection and happiness of our nature arise, in a great degree, from the exercise of our relative and social feelings, and the wider things are extended, the more excellent and accomplished will be the character that will be formed; and we find that in every nation, where commerce has been cultivated upon great and enlightened principles, a considerable proficiency has been made in liberal studies and pursuits. It is not possible for us to repress our exultation at the rising prospects and rapid improvement of our own country, nor to close our eyes to the decisive evidence which every day brings us of the mutual advantages which commerce and literature derive from each other. Not only in the metropolis, but even in the commercial towns of the United Kingdom, academical institutions are formed, and literary societies established, upon different plans and different resources, but all of them calculated to promote the great object of intellectual improvement. To what are all the astonishing improvements lately made in manufactures, in mechanics, and in chemistry, to be attributed, but to the incessant researches of those distinguished individuals whose talents have been exerted to improve the products of the soil, and to abridge the necessity of human labour.

The delight and instruction which the study of literature communicates; the perpetual charm it throws over our hours of leisure; the resources it affords against indolence and langour,—and the strong barrier it forms against vicious and degrading pursuits, will be universally acknowledged: and its direct influence on the prosperity of the community is not inconsiderable, since a refinement of taste and feeling is a natural consequence, which softens and attunes the state of society, by rendering it more intellectual. A slight reference to former times, as regards this country, and to the actual position of others where the veil of ignorance is still undrawn, is sufficiently corroborative of the fact. Such has been the progress of knowledge and taste in this country, that, in order to meet the avidity of the public, immense establishments and manufactories are required,—and thus the commerce of the country is greatly promoted. In chemistry, astronomy, mechanics, or mathematics, scarcely any discovery is suggested but it becomes converted to the use of mankind. As chemistry reduces substances to their elements, or combines them in new modes, they assist in medicine, manufactures, and in all the operations by which the calamities incident to our nature are alleviated or subdued. Astronomy assists to facilitate navigation, and to open new roads to commerce. They leave no room to conjecture as to their merits, nor any hesitation as to their advance. The navigator, manufacturer, statesman, and philosopher, concur in their opinions as to their progress and effect, and our ameliorated condition affords the best testimony of improvement.

The thick mist of ignorance is dispelled in proportion as civilization extends itself, and the mind, which once only sought for a moment's amusement, finds its curiosity and ardour awakened, and craves a wider field for its energies. We can scarcely believe that the giraffe, now so familiar to us by report, or personal inspection, was either considered a fabulous animal, or so exaggerated in the description handed down to us by the Romans, that its very existence was doubted, and its re-discovery by Levaillant, when so announced in the year 1784, was even ridiculed. With respect to the lepas anatifera, or bernacle, a fabulous notion was formerly prevalent, even amongst those who ought not to have been so deceived, and even exists, to a certain extent, in the present day, that from it was produced a species of goose, common in some parts of our island, as the bernacle goose. Within the last few years an attempt was made to impose upon the credulity of the public, by an exhibition in London of a large collection of these shell-fish, attached, as usual, to a piece of floating wreck which had been found, and from which, as the advertisement stated, the bernacle goose was produced.

Camden, in his *Britannia*, gives the following curious account of this marvel, and confirmed the public credulity which existed in his day by the weight of his authority :—

"It is hardly worth while to mention the clayks, a sort of geese which was believed by some, with great admiration, to grow upon trees on this coast, and in other places, and when they are ripe to fall down into the sea, because neither their nests nor eggs can any where be found. But they who saw the ship in which Sir Francis Drake sailed round the world, when it was laid up in the River Thames, could testify that little birds bred in the old rotten keels of ships ; since a great number of such, without life and feathers, stuck close to the outside of the keel of that ship. Yet I should think that the generation of these birds was not from the logs of wood, but from the sea, termed by the poets the parent of all things."

The remora, or sucking fish, small as it is, was absurdly believed to have the power of arresting in its progress the fastest sailing ship, by adhering to its bottom :—

> "The sucking fish beneath, with secret chains,
> Clung to the keel, the swiftest ship detains ;
> Such sudden force the floating captive binds,
> Though beat by waves, and urged by driving winds."

Having for centuries thrown aside the fabled creations of the ancients,—their griffins, dragons, harpies, salamanders, and the pelican feeding its young with its own blood,—the time has surely arrived when other absurd, thoughtless, and extravagant notions should be dispelled,—a task in the present day of no difficulty, since, from the cheap form in which the most esteemed works on all subjects are published, the acquisition of knowledge is placed within the reach of almost every person ; and facts, astounding as they may appear, can be satisfactorily proved, so that astonishment, almost amounting to awe, will take the place of incredulity. Of the coccus cacti, or American cochineal insect, for instance, no less than eight hundred and eighty thousand pounds weight are imported into Europe annually—forming a quantity of these minute insects beyond the bounds of calculation. Leuwenhoek computed the eggs of a single codfish to exceed nine millions, but there is something in his statements which, at times, startles the mind into an unwilling incredulity, or, at least, creates in it a doubt whether imagination has not been more busy than patient and cautious judgment. It is, therefore, a relief to find that another student of Nature has endeavoured to ascertain the truth, by a later and most careful examination. Mr. Harmer's investigations have moderated the amount, but display a productiveness in those fishes which he inspected, that, anterior to such researches, we should not have anticipated. He found in one codfish 3,686,760 eggs, and in a flounder 1,357,400 eggs. Such a fecundity equals the most marvellous abundance of vegetable semina. Again, without the most incontrovertible proofs being laid before us, could we believe in the immense shoals of fish which periodically frequent our shores, and make calculation look like exaggeration. "The regular migration of the herrings in their immense shoals, so distinctly dividing themselves at particular stations into separate masses, and each taking a separate course, and coming regularly to the same stations at the same recurring seasons, display determined purpose, spontaneous agency, and suited knowledge of positions, courses, and places, which imitate human will and judgment. The regular recurrences of such emigrations indicate directing instincts which, if they originate within the animal, imply ideas, choice, purpose, object, and perseverance. But on this mysterious subject our real knowledge only enables us to say, that in their stationary and natural abode, they seem tranquil, abstinent, and happy; and that the emigration from thence to the distant coasts peopled by man, to which they periodically move so multitudinously, is so connected with human subsistence and benefit, that it seems a reasonable inference that special impulses or instincts of movements are given them, on purpose that mankind may benefit from their immense productiveness." Pennant describes the shoals of herrings as distinguished into several columns, five or six miles long and three or four miles broad; a space which, as they swim very close together, must comprise some millions. They appear annually, in June, off the Shetland Islands, in their largest body. One vast portion goes to the west of Ireland, where they divide again, one fleet of them moving into the Atlantic, while another passes into the Irish Sea. Mr. Donovan describes them as coming from the Northern Ocean in one immense column, and as separating as soon as they reach the Orkneys and Shetland into three divisions. Of these, one passes along the east of Scotland; another to the Hebrides and Ireland; while the most considerable body moves between Cape Wrath and Lewis Isle, and enters the bays of the west coast of Scotland. In the year 1773, the herrings were in such immense shoals on the Scotch coasts for two months, that it appears, from tolerably accurate computation, no less than one thousand six hundred and fifty boat-loads were taken in Loch

Terridon every night. These would amount to twenty thousand barrels. They once swarmed so greatly on the west side of the Isle of Skye, that the numbers caught were more than could possibly be carried away. After the boats were all loaded and the country round was served, the neighbouring farmers made them into composts and manured their ground with them in the ensuing spring. Somewhat more than fifty years ago, the herrings came into Loch Urn in such amazing quantities, that, from the narrows to the very head (about two miles), it was quite full. So many of them were pushed on shore, that the beach for four miles round the head was covered with them from six to eighteen inches deep; and the ground under water, as far as could be seen when the tide was out, was equally so. Indeed, so thick and forcible was the shoal, as to carry before it every other kind of fish; even ground fish, skate, flounder, &c., were driven on shore with the first herrings, and perished there.

The pilchard shoals, again, give us a specimen of their numbers. Dr. Borlace says, that there were at one time enclosed in St. Ives Bay two hundred and forty-five millions of these fish. Some idea may be formed of the immense numbers of them which are caught, from the fact of forty-nine thousand five hundred and thirty-two pounds annually being paid, on an average, for such as are exported; each hogshead being computed at thirty-three shillings, (a barrel, according to its size, contains from six hundred to one thousand six hundred fish.) Pennant describes a shoal of haddocks, seen off the Yorkshire coast, as three miles broad and forty long. Mr. Jesse, who has paid much attention to the natural history of the eel, describes the annual migration of the young eels up the Thames, at Kingston, which takes place early in May, and is called eel fair. He says that these young eels are about two inches long, and make their approach in one regular and undeviating column of about five inches in breadth, and as thick together as it is possible for them to be. As the procession generally lasts two or three days, and as they appear to move at the rate of nearly two miles and a half an hour, some idea may be formed of their enormous number. On one occasion he endeavoured to calculate what number passed in a given time, and he took advantage of quiet periods, when they were far from being the thickest in the throng, and when, of course, he could more readily ascertain the number of their ranks in columns. He came to the conclusion more than once, and at different places, that there passed under a thread line he extended over the margin of the river, more than six hundred young eels in a minute; but in an hour after there must have been more than three times this number, as the wind had fallen, and they moved much more rapidly than when he first averaged their passage: in short, at some periods the quantity was so great, that all calculation was baffled.

" A new system of exterior figure, and a new species of wonder, arises to visible existence in the feathered creation. Birds eminently surpass all marine animals in their appeals to our senses, from their attractive appearance. Form, motion, finish, and colour, are elements of what is beauteous in both orders of beings ; but the lovely and the pleasing emanes to us from the sprightly tenants of the trees and air, with more interesting effect than from the inhabitants of the seas. They produce this impression by so very different a modification of bodily configuration, that unless we had experienced it, we should not beforehand have thought that such total contrasts of external form could have been made to produce such a similarity, though not equality, of gratifying result.

" It is in His kingdom of animated nature that the magnificent and munificent Creator has shown us that beauty has as many forms and varieties as He chooses to display it in ; that our intellectual faculty is trainable to an equal sensitivity of discerning and appreciating it ; that His power of imagining and producing it is inexhaustible : and that He has purposely so arranged the material particles of our world, that this magical quality is perpetually appearing to our senses, with an exuberant and ever-renewing profusion. It appears, likewise, in every department of earthy and inorganic matter. All our knowledge and love of it arise from what has been created to affect us by its presence. Beauty is, indeed, everywhere about us, and every mind may be sensible of it, that will itself observe it where it exists. For our own sakes, we ought to cherish a taste for it ; for such are its soothing effects, that it cannot be anywhere seen and felt without a sensible pleasure accompanying the perception. It is therefore an easy and universal source of enjoyment to observe it, from which every class may derive every day many moments of gentle exhilaration. The bird classes partake of it so generally in some respect or other, that the rudest minds become milder or happier from their presence in all climes, and in all ages. The plumage of birds is peculiar to their order of creation, and is always a pleasurable object both to sight and touch, and remarkable for the skill and delicacy of its composition and structure. In the Equatorial regions it is more rich and splendid in its colours, yet always harmonizing in its most contrasted tints, and in its lights and shades. The effect is sometimes gorgeous, but never tawdry. In all its combinations and lustres, it gratifies the cultivated taste; and when extensively studied, enlarges the conceptions of the imagination by its elaborate diversity.

" Birds also charm the ear, as well as regale the sight, and thus satisfy both the most intellectual of our senses. Music and beauty do not always unite in the same individual in equal excellence, as may be instanced by the nightingale and peacock. Birds of song abound in every known country; in the new continent as much as in our own older or longer inhabited one. But as they are seldom found in the depth of the dense and damp forests of any country; they are the more usual companions of civilized man. They frequent most of the cleared and cultivated plains, as if by kind appointment to increase the number of human pleasures, by warbling their own feelings and happiness in those melodies which delight the human ear as much as themselves. Neither childhood nor manhood can hear them with indifference. Their notes are every where a large addition to human gratification, and become connected with the sweetest remembrance of the most joyous and impressible period of our lives. They are usually small birds, and seem to be indestructible; for although cultivation, as it spreads, drives off many other species, yet supplying these with more of the food they like best—they multiply from its abundance; and wherever gardens, fields, or trees appear, some classes of these rural musicians are sure to be part of the feathered inhabitants. England possesses a pleasing share. Birds surpass all other animals in the faculty of continuing their motion without resting, as well as in its rapidity. The fleetest courser can scarcely ever run more than at the rate of a mile in a minute, nor support that speed beyond a few such exertions. But the swallow does this for pleasure for ten hours a day. The carrier pigeon moves with at least half that velocity from this island to the continent, and from one country to another." One, for instance, has been known to fly from London to Antwerp, a distance of a hundred and eighty-six miles in a direct line, in five hours and a half, being at the rate of thirty-four miles an hour. Audubon says of the migratory pigeon of America, that individuals have been killed in the neighbourhood of New York, with their crops still filled with rice, collected by them in the fields of Georgia and Carolina, the nearest points at which this supply could possibly be obtained; and as it is well ascertained, that owing to their great power of digestion, they will decompose food entirely in twelve hours, they must have travelled between three and four hundred miles in six hours, making their speed, at an average, about one mile a minute." The golden eagle is supposed to dart through the fiercest storm, at the rate of forty miles an hour; but one of our smallest birds, the swift, can even quadruple the most excited quickness of the race horse for a distance, and therefore with a continuity of exertion hardly within the bounds of our reasonable belief.

" One of the most special appointments of Providence as to birds, and which nothing but chosen design, and corresponding ordainment can explain, is the law that so many kinds shall migrate from one country to another, and most commonly at vast distances from each other. They might have been all formed to breed, be born, live, and die in the same region, as occurs to some, and as quadrupeds and insects do. But it has chosen to make them travel from one climate to another, with unerring precision, from an irresistible instinct, with a wonderful courage, with an untiring mobility, and in a right and never failing direction. For this purpose, they cross oceans without fear, and with a persevering exertion that makes our most exhausting labour a comparative amusement. Philosophy in vain endeavours to account for the extraordinary phenomenon. It cannot discover any adequate reason. What decides birds to migrate? It is not want of nourishment, for most begin their journey while they have abundance. Those confined in cages are restless at the time of their proper migration. Atmospherical currents are not the cause, nor do the changes of season explain it; as the greatest number set off while the weather is yet fine; and others, as the larks and starlings, arrive while the season is bad. Atmospherical influences can only hasten the migration in autumn, or retard and derange it in the spring. It is the presentiment of what is to happen which determines birds to begin their journey. It is an instinct which urges them, and which initiates them into the meteoric alterations which are preparing. They have a particular faculty of foreseeing the rigours of the coming season, an exquisite sensibility for atmospherical changes, which have not yet arrived, but are approaching. "We can only resolve all these astonishing journeys into the appointment of Him, who has assigned to every bird the habits, as well as the form, which it was His good pleasure to imagine and to attach to it. The watchful naturalist may hear, if not see, several migrations of those which frequent our island, both to and fro, as spring advances, and as autumn declines. They are more numerous in the latter season from the addition of their progeny. Their movement takes place chiefly at the latter part of the night, or at early dawn, though some are seen in the more advanced part of the morning; but as they sail along the higher regions of the atmosphere, they are much oftener audible than visible to us on the surface of the earth.

"The quantity of individuals of the various bird genera, which are at any one time, and at all times existing in the world, surpasses not only our usual supposition, but even all power of human numeration, at least, as to any real, distinct conception of the amount; for we can only pen down the words millions, billions, trillions, and such other mentative terms, in which all actual comprehension soon becomes lost in mere verbal sounds and confusing obscurity. It will, therefore, be better to particularize a few instances of what has been seen at only four points of the globe, so that an inference may be drawn from these of the unaccountable myriads of millions, in all classes, of the feathered race, which must have been elsewhere then existing, and are now pervading both our aërial and vegetable domains.

"The purple grakle of Pennsylvania, when they collect to migrate to the lower parts of Virginia, Carolina, and Georgia, sometimes form one congregated multitude of many hundred thousands.

"Capt. Flinders, on his voyage, saw a stream of stormy petrels, which was from fifty to eighty yards deep, and three hundred yards or more broad. The birds were not scattered; but flying as compactly as the full movement of their wings seemed to allow; and this stream of petrels, for a full hour and a half, continued to pass without intermission at a rate little inferior to the swiftness of a pigeon. Now, taking the stratum at fifty yards deep by three hundred in breadth, and that it moved thirty miles an hour, and allowing nine cubic inches of space to each bird, the number would be one hundred and fifty-one millions and a half.

"In the *Literary Gazette* of October, 1839, it is stated that an officer, who visited South Shetland in the antarctic regions, saw there many millions of penguins. The ground was covered, in some parts, to the extent of two or three miles with them."

The migratory pigeon, in the United States, exhibits a number still more enormous. The multitudes of these birds almost pass belief. Audubon states, " that, in the autumn of 1813, he left his house at Henderson, on the banks of the Ohio, on his way to Louisville. Having met the pigeons flying from NE. to SW. in greater numbers than usual, he felt an inclination to enumerate the flocks that would pass within reach of the eye, in the course of one hour. He dismounted, and seating himself on a small eminence, began to mark in his pocket-book a dot for each flock which passed. Finding, however, that this was scarcely possible, and feeling unable to record the flocks, as they continually increased, he rose, and counting the dots already put down, found one hundred and sixty-three had been made in twenty-one minutes. He travelled on, and still met more the farther he went. The air was literally filled with pigeons, the light of noon-day became dim, as during an eclipse." Whilst waiting for dinner at the inn, Audubon saw, at his leisure, immense legions still going by, and he adds, " but I cannot describe the extreme beauty of their aërial evolutions, when a hawk chanced to press upon the rear of the flock. At once like a torrent, and with a noise like thunder, they rushed into a compact mass, pressing upon each other towards the centre.

In these almost solid masses, they darted forward in undulating and angular lines, descended and swept close over the earth with indescribable velocity, mounted perpendicularly, so as to resemble a vast column, and, when high, were seen whirling and twisting within these continued lines, which then resembled the coils of a gigantic serpent." Before sunset, Audubon reached Louisville, distant from Hardenburg fifty-five miles; the pigeons were still passing in undiminished numbers, and continued to do so for three days in succession. Audubon attempts to reckon the number of pigeons in one of these flocks, and the daily quantity of food consumed by it. He takes as an example a column of one mile in breadth, and supposes it to be passing over, without interruption, for three hours, at the rate of a mile a minute. This will give a parallelogram of one hundred and eighty miles by one, averaging one hundred and eighty miles, and allowing two pigeons to the square yard, there is one billion, one hundred and fifteen millions, one hundred and thirty-six thousand pigeons in one flock, and as every pigeon consumes fully half a pint a day, the quantity required to feed such a flock must be eight millions, seven hundred and twelve thousand bushels per day. Audubon thus describes the appearance of the pigeons at one of their roosting-places: "The sun was lost to our view, yet not a pigeon had arrived, but suddenly there burst forth a general cry, 'Here they come.' The noise which they made, though yet distant, reminded me of a hard gale at sea, passing through the rigging of a close-reefed vessel. As the birds arrived and passed over me, I felt a current of air that surprised me. Thousands were soon knocked down by men provided with poles. The current of birds, however, kept still increasing. The fires were lighted, and a most magnificent, as well as a wonderful and terrifying sight presented itself. The pigeons, coming in by thousands, alighted every where, one above another, until solid masses of them, resembling hanging swarms of bees as large as hogsheads, were formed on every tree, in all directions. Here and there the perches gave way under the weight with a crash, and falling to the ground, destroyed hundreds of the birds beneath, forcing down the dense groups with which every stick was loaded. It was a scene of uproar and confusion. I found it quite useless to speak, or even to shout, to those persons nearest to me. The reports, even of the nearest guns, were seldom heard, and I only knew of the firing by the shooter reloading. No person dared to venture within the line of devastation. The hogs had been penned up in due time, the picking up of the dead and wounded, being left for the next morning's employment. Still the pigeons were constantly coming, and it was past midnight before I perceived a decrease in the number of those that arrived. The uproar continued, however, the whole night, and as I was anxious to know to what distance the sound reached, I sent off a man accustomed to perambulate the forest, who, returning two hours afterwards, informed me he heard it distinctly when three miles from the spot. Towards the approach of day, the noise rather subsided; but long ere objects were at all distinguishable, the pigeons began to move off in a direction different from that in which they had arrived the evening before; and at sunrise all that were able to fly had disappeared. The howlings of the wolves now reached our ears; and the foxes, lynxes, bears, and other wild animals were seen sneaking off from the spot, whilst eagles and hawks of different species, accompanied by a crowd of vultures, came to supplant them, and enjoy their share of the spoil. It was then that the authors of all this devastation began their entry amongst the dead, the dying, and the mangled. The pigeons were picked up and piled in heaps, until each had as many as he could possibly dispose of, when the hogs were let loose to feed on the remainder."

In the history of the voyage of discovery towards the North Pole, in 1818, by his Majesty's ships *Dorothea* and *Trent*, under the command of Captain Buchan, R.N., there is besides this additional fact recorded.* "At the head of Magdalena Bay is a high pyramidal mountain of granite, termed Rolge

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* Edinburgh Review.

Hill, from the myriads of small birds of that name which frequent its base, and which appear to prefer its environs to every other part of the harbour. This bird with a foreign name, is the common auk, the *Alca allæ* of naturalists. They are so numerous that we have frequently seen an uninterrupted line of them extending to a distance of more than three miles, and so close together that thirty have fallen at a shot. This living column, on an average, might have been about six yards broad, and as many deep, so that allowing sixteen birds to a cubic yard, there must have been nearly four millions of birds on the wing at one time." The number he has thus calculated, Captain Beechey himself says, who edited the work, appears certainly to be very large; yet when it is told that these little auks rise in such numbers as completely to darken the air, and that their chorus is distinctly audible at a distance of four miles, the estimate, he thinks, will not bear any reduction. Besides, in California, he tells us, the ducks and geese cover the ground for so many square acres so effectually as completely to change its natural colour; and that Audubon, speaking of the passenger pigeon in its visit to the banks of the Ohio, estimated the number of birds upon the wing at one time, at one billion one hundred and fifteen millions and upwards. Such numbers are so wonderful as almost to surpass human credibility. The mind, besides, is perplexed and puzzled in an attempt to grasp the value of the word billion by its name only, or by the figures that represent it; but in the present case it may be thus stated:—suppose four birds to extend a yard in a straight line, that line would surround the globe at the equator six times, or a belt of six birds in width would encompass the earth at its greatest circumference. This, like everything else in the creation, is wonderful; and little less wonderful how and where these multitudes can possibly find food for their support, but more especially those in the arctic regions of eternal ice, both on the sea and the land—how the myriads of animals peculiar to the two elements can contrive to subsist, and not only subsist, but to derive their full share of enjoyment and happiness—for Captain Beechey tells us, "all nature seems to acknowledge the glorious sunshine, and the animated part of the creation to set no bounds to its delight."

The narrative continues to say: "although surrounded by beds of snow and glaciers, with the thermometer scarcely above the freezing point, there was no sensation of cold. The various amphibious animals, and myriads of birds which had resorted to the place, seemed to enjoy, in the highest degree, the transition thus occasioned by a few bright hours of sunshine. From an early hour in the morning until the period of rest returned, the shores around us reverberated with the merry cry of the little auks, willocks, divers, cormorants, gulls, and other aquatic birds; and wherever we went groups of walruses basking in the sun mingled their playful roar with the husky bark of the seal. There was certainly no harmony in this strange din, but it was, at the least, gratifying to know that it arose from a demonstration of happy feelings. It was a pleasure of the same character as that which must have been experienced by every traveller who, on some fine bright evening in a tropical climate, has listened to the merry buzz of thousands of winged insects which immediately succeeds the setting of the sun. And here we cannot fail to notice the manner in which the great Author of Nature has varied his dispensations. In the burning region of the torrid zone, the descent of the sun calls into action myriads of little beings which could not exist under the fierce glare of his meridian ray; whereas here, on the contrary, it is the signal for universal repose."

This surprising quantity of birds makes it necessary that the insect world, on which all the smaller feed, should be a thousand times more numerous. The two millions of starlings usually resident in the United States of America, have been computed to consume of the grubworms, caterpillars, and other larvæ, on which they subsist, in the four months of their breeding and nurturing their young, sixteen thousand two hundred millions. But if a single kind of birds has this supply, all the other classes, which use the same nutriment, require as much. It is obviously impossible to enumerate the amount of the individual living creatures which are always existing on the globe, and particularly on its produce in some way or other. Yet so admirably are the whole placed and disposed, and the size of each so carefully regulated and adapted to us and to each other, that we are neither disturbed by the number, nor even conscious of it. There is no crowding; no confusion; the enormous amount is nowhere visible to our sense. We must search it out in order to know it. We must calculate from what we can observe, before we can conceive or believe the ever palpable but unobtrusive truth. What but an almighty and all-adjusting sagacity, infinitely beyond the expansions of human genius, could have arranged such inexpressible multitudes of living, sentient, and ever-moving beings, into positions, limitations, and habits, so wisely appropriated to each, and yet so conservative of the harmony, the order, and the general welfare of the immense and uniform whole." The most informed and indefatigable philosopher has yet as much to learn as he has already appropriated. Thousands are now exploring Nature in all directions, and find that the more new facts of its beings, laws, substances, and qualities they discern, the more also they perceive to remain unfathomed. Nothing in it, that has a material form, can be pronounced to be unknowable. Human sagacity still finds every region of substances penetrable yet further by its patient industry and continued thought. We are gaining more insight into their principles, laws, and phenomena, every year of our existence; but most of us are contented with but a moderate portion of the knowledge of Nature; many with a general outline; some with a superficial survey; others with almost none. This is left to our personal taste and choice. It is ever inviting us to make it our possession, and it rewards with mental happiness every spirit that will acquire it; no other enjoyment is so unsatiating or so lasting; nor can its abundance be exhausted.

"Vegetable nature has, at all periods, and in all countries, affected the imagination and feelings of mankind. But it is not an imagination, it is a sober reality, to say, that, wherever the floral creation has been cherished and cultivated, it has drawn the human spirit to seek and value the gentler and kinder dispositions and occupations of our very deviable, moveable, irascible, and sturdy self-will. As these moral, intellectual, and religious results are the natural effects of the vegetable creation upon mankind, and appear more or less so much in all countries and in all ages, as to indicate that impressions of this sort are universal, we are entitled to infer that these consequences were among the purposes for which this order of beings was created, and which they were appointed to produce. The general effects of all made things imply that the intention of the Creator was to produce them. So we may reason as to the design and ends of the Creator in his vegetable classes. They increase our knowledge of Him ; they are the pledges of His affection for the human race, and gentle attractions of our sensibilities to Him. They are the great source of our subsistence, convenience, and improvement; they are the basis of all animal nutrition ; they furnish our most constant gratifications and purest pleasures; they tend to link our kind feelings with each other, by the sympathizing admiration which their beauties excite ; the cultivation they require is our most virtuous and beneficial occupation ; and their serviceable properties are so arranged as to compel us to their useful cultivation by their produce being made from it. Their operation on our intellectual faculties and moral emotions is likewise that of a soothing melioration, which increases as our mind advances to its progressive civilization. All the beautiful thoughts and sentiments which poetry has breathed in every age in praise of verdant or floral Nature, and of the rural life, are the expressed homage of the heart to the charms and utilities of the vegetable creation, and are so many undesigned but implied encomiums on its invisible Author for planning and ordaining it.

Whatever we may mean, or whatever praises we may use, we cannot commend Nature without praising Him. The panegyric flies immediately from the insensate beauties we may admire to the mind which designed them, and to the power which produced them. Carbon and oxygen are but the same things in the rose as they are in the grey limestone-rock. It is the intellect and taste of the sublime Mechanist which has combined and arranged them, and similar brute matter, into loveliness and fragrance in the one, and left them in the other to be uninteresting shapelessness and unseemly deformity."

> "These, as they change, Almighty Father, these
> Are but the varied God. The rolling year
> Is full of Thee. Forth in the pleasant spring
> Thy beauty walks, Thy tenderness and love.
> Wide flush the fields; the softening air is balm;
> Echo the mountains round; the forest smiles,
> And every sense and every heart is joy.
>
> * * * *
>
> Thy bounty shines in autumn unconfin'd,
> And spreads a common feast for all that lives."

How natural to add—

> "Soft roll your incense, herbs, and fruits, and flowers,
> In mingled cloud to Him whose sun exalts,
> Whose breath perfumes you, and whose pencil paints."

What benefits are not conferred nationally, as well as individually, by the cultivation of these and similar feelings! Is it not our duty to promote them by every means in our power among those whom we are accustomed to consider as far behind ourselves in every art of life? The germ, in a multitude of instances, already exists, and may, by encouragement and kind care, be brought to produce fruit of promise.

The character of individuals may be often read by noticing their attention to external appearances, their anxiety to add to their comfort and happiness by drawing around them those little luxuries and amusements which occupy their time, as well as gratify and refine their tastes. It is impossible, for instance, not to notice with pleasure the appearance of many of our labourers' cottages. The rude attempt to cultivate in an ornamental way the little plot of ground before their doors, and to adorn the porch with creeping plants, grateful both to the eye and smell; the little apiary, the song-bird in its cage over the window, have charms which come home to the very heart. An universal neatness and cheerfulness pervades the scene: the sterling effects of industry, prudence, and content. That man may be considered to be a kind and indulgent parent, and a good neighbour, possessing, under perhaps a rude exterior, those virtues and estimable qualities which it is our duty, as it should be our anxiety, to endeavour to cultivate by instruction and precept.

Rich in feelings of benevolence and love, the admirer of Nature and her works, as well as the good naturalist, shrink from the destruction of, or even the infliction of pain upon any living creature. He will say with my Uncle Toby to the fly, "Go, go, poor devil, get thee gone, why should I hurt thee?—the world is surely wide enough to hold both thee and me." He looks with reverential awe on the works of the Framer of the universe, who made no one being in vain, nor without its use. Cowper justly says—

> "An inadvertent step may crush the snail
> That crawls at evening in the public path;
> Yet, he who has humanity, forewarned,
> Will step aside, and let the reptile live;
> For they are all, the meanest things that are,
> As free to live and to enjoy that life,
> As God was free to form them at the first,
> Who in his sovereign wisdom made them all."

The various subjects comprising the three kingdoms of Nature, so artfully contrived, so wonderfully propagated, and so providentially supported, seem to have been intended by their allwise Creator for the convenience of man, to whose uses everything is rendered subservient: he tames the fiercest animals,—he pursues and catches the swiftest; whether, like himself, they roam on the surface of the green earth, float in the regions of the air, or glide through the abyss of the ocean. He increases the number of vegetables, affording foodful substance, and from this kingdom obtains what is necessary and convenient for food, for clothing, for medicines, and for an endless variety of purposes. He descends into the bowels of the earth, and extracts from thence those substances by which he is enabled to reduce to his purposes the other kingdoms of nature: he contrives to render the hardest substances fluid; to separate the useful metal from the useless dross; in fine, by the inscrutable wisdom of unerring Providence, man is enabled to apply almost every object that surrounds him to his service, that, availing himself of the benefit offered, he may be induced to look up "through nature unto nature's God," and to pay that homage so justly due to the Divine Author of his being; and that, by using as not abusing the manifold blessings vouchsafed to him, he may be continually induced to offer adoration and praise to the great First Cause "who in his sovereign wisdom made them all."

# PHYSIOGNOMY AND CHARACTERS
# OF
# ANIMALS.

THERE is a French work in existence—a book of plates—which gives the heads of different animals, and which, by the adaptation of the outline to the human face, without altering the expression, shows at a glance the extraordinary likenesses which exist between some men and the brute creation. The resemblance to the lion and eagle are matters of frequent occurrence; and it requires no Lavater to distinguish the fox, sheep, goat, camel, horse, and even pigeon, in the human features. I am not physiognomist enough to have watched whether the character of the animal is shared with the likeness; but if so, it is not a general rule, as I number a pigeon among my own acquaintance, and he is certainly not one in character.

I have often amused myself by attempting to trace a similarity of habits and character between the different orders of animals; for instance, the fox, magpie, and perch; the sheep, pigeon, and carp; the tiger, hawk and shark, possess, in a remarkable degree, in their respective elements, the same attributes. But it is well known that every individual animal, as with man, varies in character with those of its kind. Among domesticated animals—to take the cases of the dog and horse—how evident is the fact; and the shepherd remarks the same peculiarity in his flock. If, in the attempt to reclaim or to tame any given animal, some attention were paid to this subject, much patience might be saved, and greater success ensured, and a few days' trial would be sufficient to ascertain the capabilities of the pupil. From watching the tempers of birds attentively, and in some respects by suiting mine to theirs, I have been very successful in taming many different species; but I have never carried my experiments so far as to attempt an "united happy family," the exhibition of which in our public streets is a practical proof of what I state.

Domestication certainly affects most materially the tempers of both animals and birds; the hare, for instance, timid, watchful, and ready to fly at the least approach of danger in its wild state, becomes obtrusive and petulent, and resents any too great familiarity, by striking, cat-like, with its fore-feet. The rook, with a kind of intuitive notion of the range of a gun-shot, keeps ever without its limits, and, even when apparently most engaged, has an eye to danger; and with its beard on its shoulder, to use a very significant Spanish proverb, is ever watchful of its safety, and exercises the most profound vigilance; but rear him in the presence of man, and he is at once daring, insolent, and a bully: the love of mischief and fun becomes also a predominant feature, and the roguish leer of the eye, with the head askance, can leave no doubt but he is richly enjoying himself.

For many years a white rook was kept in the yard of the Ship Inn at Feversham, where I often saw him, but he was a dull bird. In the course of time I found him replaced by one of the ordinary colour, whose drolleries I often witnessed. The inn in question was much frequented by commercial travellers, whose chaises, if their stay was a brief one, were allowed to remain in the yard. This rook, in a listless manner, and as if he had no object in view, would hop about one, and, at last, disappear under the driving seat. In a short time the horse was put too, and the traveller drove on to the next stage, when the rook issued from his concealment, and, by the most impressive croaks, signified his delight at his escapade. This was of constant occurrence, and, as the bird was well known, he was invariably sent back, and the landlord assured me, that these jaunts cost him many shillings for the return carriage.

Another bird, on the same road, either at Dartford or Welling, was in the habit of accompanying a coach, which changed horses at his master's house on its way to London, till it met the down coach, when it transferred itself to that vehicle and returned home.

But the eccentricities of poor Jack, which I took as a mere squab from its nest, were not a little remarkable. From accustoming him to the sound of a partridge call when I fed him, I could always command his presence, although, when hungry, he invariably found me out, croaking and fluttering his wings in the manner peculiar to young rooks, even in his mature age. With the full power of flight, he never abused his freedom, although his vagaries often carried him to some distance from home. The terror of the dogs and cats in the neighbourhood, he at last carried his persecutions to the pigeons, which he would attempt to join in their flights. My Newfoundland dog, whose bushy tail he was delighted with hammering at, slunk away from him, and the very cats were not allowed to approach their plate of meat till some fresh object caught his attention. He would invade my room, and if I were writing, he would contest the ownership of the pen. Pilferer and thief, he stole any thing within his reach, and to that circumstance I ascribe his loss.

Numerous were the complaints of the neighbours, whose rest he would disturb, by tapping, in the early morning, at their windows, and if, by chance, he found one open, some object was sure to be missing. The alleged loss of a diamond ring sealed his fate, as its owner, as I was informed, put him beyond the power of farther mischief. The most singular proof of its attachment was shown in the following circumstance. I was standing on the top of the high cliff by the western heights in Dover, and had whistled him up from below to his accustomed place on my arm, when a salute was fired from the citadel, in honour of the arrival of some personage of distinction. The poor bird's terror was extreme, and he flew off in a straight direction over the sea, till he became a mere speck, and I gave him up for lost. Presently, when the firing ceased, and all was again still, I saw him, to my great joy, returning, and he again settled on the extended arm.

The Royston crow is with us a migratory bird, and comes to us from the North of Europe, but the migration does not extend to the whole body, as a vast number remain in those cold regions throughout the winter. I have seen them stalk about perfectly unmolested in the streets of St. Petersburg, and on the frozen surface of the Neva, hardly troubling themselves to move from the throng of sledges and passengers, and daring from hunger they enter the court yards of houses, and even take food from the ledges of windows. Doubtless they are driven into the towns and the haunts of man for the purpose of food, for, on the approach of spring, they retire into the neighbourhood, where they build in vast quantities; but there is no collection of nests, no congregation of numbers. They select their situations at distances from each other, and bold from impunity, I have seen them sitting on their nests, in the stunted birch trees on the edge of the public roads.

No gun is allowed to be fired off within the city, under a most severe penalty. The absence of all molestation therefore soon creates a sense of security, which is taken due advantage off. Twice, on the Linseed Wharf, I saw a crow stoop to a flock of pigeons feeding on the scattered grain, and bear one off, even when I was standing within ten yards of the spot.

I have found, on the observation of many years, that these birds arrive with us, in or about the 9th of October, and leave on the same day of March. I do not remember where I first saw or heard of the following way of catching rooks. A few small cones of paper, such as are used by grocers for trifling articles, smeared with bird-lime in the inside, and with a small piece of flesh dropped in by way of bait, should be thrust with the point downwards, in dung heaps, or other places frequented by rooks.

The birds plunge their heads in to extract the flesh, and the cone, attaching itself by means of the bird-lime, the bird is completely "bonneted." It immediately towers upwards, in a spiral direction, till exhausted, and then drops to the earth, when it may be easily caught.

Ravens are by no means numerously distributed about England; they are found mostly near cliffs on the sea-shore, and by the estuaries of rivers, and I have never heard of a pair breeding inland excepting in the case described in White's "Natural History of Selbourne," although, of course, that is not a solitary instance. On a journey I made to Moscow in the summer of 1840, I was very much struck with the great quantity of ravens. I could not learn whether they frequented the district habitually, or whether they were attracted there by any abundance of food. It was a peculiarly wet summer, and the almost interminable morass was deeper in water than usual, and thus an immense number of the smaller animals must have perished, and have afforded a rich repast. The solitude also, arising from the paucity of population, was most congenial to their habits; but they seemed to have little dread of man, for the rapid pace and occasional near approach of our carriages had little effect on them.

Among the rocky islands in the Fiords, in Sweden

I often saw them drive the wild duck from its nest, and devour the eggs.

The jackdaws are an amusing race. In the public streets of St. Petersburg they abound in great quantities, strutting familiarly about, and as much habituated to the noise and bustle of life as a London sparrow. There are no old buildings or rocky crags for them to make their nests in, and they therefore select for that purpose the broad eaves of the houses, and the recesses in the capitals of the many columns. In the absence of wool or other soft material for the lining of its nest, I saw one settle on the back of a cow, and after repeated suggings, collect and carry off a good beakful of its coat.

Varieties are not at all uncommon among this species; I have often seen them with spots of white in their plumage, and more frequently with entire white feathers in the pinions. I have also met with several instances of a deformity which I never found in any other bird, namely, a most extraordinary curvature of the two mandibles; the upper one bending considerably downwards, and crossing the lower one, which projected equally upwards. It is difficult to imagine how the bird could feed in this state; and yet, being plump and full feathered, the obstacle must have been slight.

Spread as these birds are over so many parts of the world, I am informed by an intelligent American friend, that they do not exist in the United States; and I can find no mention of them in any work. This friend, a Bostonian, was extremely anxious to introduce a pair, and I have no doubt they would have thriven. The opportunity has been lost for the moment, but on his next visit to Europe he will carry out his intention.

Birds of prey are very numerous in Russia, and the *Falco ossifragus* peculiarly so on the shores of the upper part of the gulf of Finland, towards the embouchure of the Neva. An acquaintance of mine, and an observant naturalist, occupying an estate at Alexandrofski, six miles from the capital, assured me that on one spring morning he saw upwards of two hundred of these birds congregated in a wood on his land, where they remained for a couple of hours, and then separated. He noted the day in his diary, and on the following year was on the watch for a similar event, but not more than twenty birds were assembled. This fact, as regards predacious birds, is highly extraordinary, and must remain as deep a mystery as the equally well authenticated cases of large flocks of storks, herons, and crows, assembling, although in one or two instances the death of one of the party, by the whole mass falling on it, would make it appear that they had met to try and punish some offender. The eagles may have had a gathering after their migration; for that they do migrate partially, and are gregarious for the moment, there is no doubt. In October 1840, after a heavy fall of snow, and during a sharp frost, I saw, in my passage down the Baltic, seven eagles bending their course from Sweden to the Prussian shore; and the fact of many individuals of this species being shot every winter in England, proves sufficiently that they are periodical visitors.

I was very much struck, on my entrance into Moscow, by noticing a flock of eight or ten buzzards soaring over the city at a great height, with that circular and graceful movement so peculiar to birds of prey. A short residence brought me into contact with many more, as they darted fearlessly into the court-yards of the houses to pick up offal or other food. They are tolerated for the service they render as scavengers, like the Turkey buzzard in the West Indies; and they propagate and roost in the steeples and minarets of the many churches. They are the common buzzard—*Falco buteo.*

A singular circumstance connected with a kestrel occurred at Dover some short time since. The common guillemot (*Uria troile*) breeds in considerable quantities in the cliffs to the eastward of the town, where they are rarely disturbed, excepting by some adventurer lowering himself from above to take eggs, or by some gunner anxious to try his dexterity from below. In the present instance a kestrel, soaring along the surface of the cliff, bore off a squab guillemot from its nest in one of the ridges. This, from the weight of the young bird, was a matter of some difficulty, and enabled the old one, which had taken the alarm and become desperate in defence of its young, to come speedily up to the kestrel, when a sharp contest began between them. The hawk, burdened as he was and determined to keep his prey, was bent on retreat; the guillemot, therefore, notwithstanding the awkwardness of its flight, was enabled to push him hard, and to annoy him so much that, in self-defence, he was compelled to drop the young one, which fell unhurt on the beach below. Then began the battle in good earnest: in a straight line the guillemot had the decided mastership, by charging the hawk *a posteriori*, with its sharp bill, and apparently with some success, as the flying feathers indicated. But these attacks always finished by the hawk soaring upwards and then stooping at its opponent. The watchfulness with which the guillemot avoided these charges, and availed itself of the hawk being again undermost to renew the engagement, was highly interesting; and from the vigour with which it pushed its foe on these occasions, the victory seemed to be safe; but, at last, one unlucky stoop made by the hawk, from a considerable height, struck the poor guillemot with such violence that it could not recover its flight, and came tumbling to the beach alive and unhurt, but so much exhausted that it was picked up, and now, with its young one, forms a portion of my cabinet.

# MIGRATION OF BIRDS.

The migration of birds is one of the most astonishing features in the economy of nature, whether as regards the great diversity of species it embraces, or the manner and seasons in which it is performed. With respect to those which arrive in the autumn and leave again as soon as spring approaches, there is less to wonder at, and there is a less degree of instinct displayed. The different wild fowl, and some few land birds, whose *habitat* is peculiarly in the north of Europe, travel southward only as they are driven on in search of food by the rigour of winter. They have no fixed destination, and are mostly on the move from spot to spot, many of them in flocks, as the circumstances of food and safety influence them; and notwithstanding the vast flights which migrate to this country, it must be borne in mind that, perhaps without an exception, there is not one of the varieties which is not to be found as indigenous. That the wild fowl should prefer the solitudes and morasses of the north for the purpose of breeding is natural; but that larks, fieldfares, thrushes, &c., should leave a country at the moment when the supply of food would appear to be inexhaustible is indeed surprising, and can only be accounted for by looking to higher causes.

The swallow tribe, and many other species of birds, migrate without any apparent or ostensible cause, leaving climates in every respect adapted to their habits, for those which can offer them, at the best, but a short and precarious season; unless, indeed, they come as the humble instruments of an all-directing Providence, to save us, as it were, from one of the plagues of Egypt, by ridding us of the myriads of flies which would otherwise infest us. The distribution of other migratory birds leads to this belief:—Storks, for instance, which rarely visit this country, are numerous throughout Germany and Holland, where frogs abound. The benefit they confer is so great, and so much appreciated, that they are especially protected, and a fine is imposed on the destruction of them. In the duchy of Holstein the inhabitants erect a curious kind of fork on the gable end of their houses, as a support to the nests, and to entice the birds to build, it being considered a lucky omen to possess a nest. These birds, the swallow tribe, and some others, return to their old and accustomed quarters with each succeeding spring, reoccupying the old spot, and, indeed, the old nest, should it not have been destroyed in the interim. The instinct which drives them across the waters is almost less to be wondered at than this effort of memory, for it can be called by no other name.

Single swallows seem to precede by some days the arrival of the great mass; but on the return of a cold wind, or of one of those bleak days—the last expiring struggles of winter—they again disappear. Food there can be none, and they are not capable of long abstinence; and yet, on the return of sunshine and milder weather they are again on the wing. In the spring of 1834, which was particularly cold and backward, I noticed the first swallow on the 8th April; but bleak north-east winds immediately intervening, it was not seen again till the 19th.

Now, supposing a swallow to fly at the rate of ninety miles an hour, it would arrive in Egypt in little more than thirteen hours; and this, or some other similar point, would be its destination, for no one can entertain for a moment that most absurd of all notions—that swallows either hybernate like bats, or have the faculty of existing in a state of suspended animation under water. Indeed, I never could understand why this extraordinary attribute, this entire contradiction to the laws of nature, should hold good only with the swallow, whose untiring velocity can change seasons at will, and bid defiance to time and place, while other migratory birds—of more circumscribed powers and of more delicate frame—are passed over in silence. That the migration of swallows was known and noticed at an early period is proved by holy writ: "The stork in the heavens knoweth her appointed time; and the turtle, the crane, and the swallow observe the period of their coming;"* and ought at once to silence all doubts and theories; we should be satisfied, therefore, with the fact, and leave the cause or impulse as one of those mysteries of Providence, which not only baffles our ingenuity to discover, but is hid from us.

There is yet another point which proves the absurdity of this theory, as well as the slight foundations on which it is built. In all the instances advanced in support of this alleged hybernation, the generic word swallow is always used, and that cannot mean otherwise than to embrace the whole family of hirundines. The well-known and acknowledged fact, that the great body of these birds disappear suddenly and unseen, excepting perhaps some few weak or lately hatched individuals, which follow at a later period, has given rise to this absurd, and at one time almost general opinion. The four varieties which frequent this country, and indeed all the northern parts of Europe, arrive and depart at different periods, and even at long intervals from each other; thus the swift comes last (in May), and departs first (in August), without leaving a straggler behind; the sand martin precedes it by a few days, and follows it towards the end of August; and the swallow (*hirundo rustica*), which invariably arrives first, leaves early in October; and no suspicion has ever been entertained, or even hinted at, that any of these varieties hybernate with us, simply because they are never seen late in the autumn; but the martin (*hirundo urbica*), under the all-comprehensive name of "swallow," has alone given occasion for this monstrous absurdity, because some individuals have been unfortunately prevented from following at the proper period. The sand martin, from its habits, could secure a most snug hybernaculum, but no one doubts the fact of its emigration, while the poor martin alone is doomed to set all the laws of nature at defiance. It is notorious, as I have stated, that it arrives in this country after the swallow; and why should this be so if it only hybernates, since the same warm and genial weather, the same mildness of spring, which brings the swallow, would surely arouse it from its torpidity, and send it careering through the heavens long before the other would arrive? I subjoin a table of the dates on which I have seen the latest stragglers:—

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* Jeremiah viii. 7.

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| 1828 | November 14—in numbers. |
| 1829 | November 10—solitary birds. |
| 1830 | November 18—solitary birds. |
| 1831 | |
| 1832 | |
| 1833 | November 23—in numbers. |

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|---|---|
| 1834 | November 6—single birds. |
| 1835 | |
| 1836 | |
| 1837 | November 2—single birds. |
| 1838 | |
| 1839 | |
| 1840 | November 14—single birds. |
| 1841 | |
| 1842 | December 2—one bird. |
| 1844 | November 24—several. |

The hirundines in general collect at times for other purposes than migration. Mr. Jesse describes a vast flight of swallows in these words:—"1818. No rain had fallen for some weeks previous to the 26th July. Flowers of every description had entirely disappeared, and the ground was parched to an extraordinary degree. About six o'clock in the evening of that day, some rain fell. I was at that time standing at a window, looking on the river Thames. In an instant the surface of the river was covered with an incredible number of swallows, which remained flying, some near the water and others at a considerable height above, till the rain had ceased, when not one of them was to be seen." I have noticed similar collections under different circumstances. On the 2nd July, 1834, I was walking on a remarkably fine evening round the precincts of Dover Castle, when I remarked that the air was swarming with swifts; a large flock of many hundreds wheeling about in all directions, but without their accustomed screams. At first their flight was not high, but they increased it as evening drew on, till at last they totally disappeared at various points of the compass. So many of that bird could not have been the produce of one neighbourhood. On the 25th and 26th days of June, 1835, I witnessed at Dover a still more extraordinary fact. The weather on those days was remarkably tempestuous and severe for the season. The thermometer ranged from 56° to 60°, with a strong wind from the north, accompanied with violent and incessant rain. The swallows and martins kept themselves concealed and sheltered, with the exception of a few individuals which were picked up exhausted and perishing on the sea-shore; but the swifts, of which, during many years' observations, I had never seen more than a few families in the neighbourhood, came into the town in incredible quantities, hawking fruitlessly about for food in all directions, and so low that they were destroyed by dozens by idle boys with sticks, and one urchin boasted that he had knocked down no less than nineteen. In sheltered situations in various parts of the town, they were seen hanging from the walls in masses of fifty and sixty, like swarms of bees, and in this state they continued during the two days; but the weather on the 27th having changed for the better, they were again on the wing, but did not return to the higher regions, and their accustomed haunts about the castle and the cliffs for another day or two. There is no way of accounting for a congregation of so many hundreds of the swifts as assembled on this occasion, and particularly as the neighbourhood is by no means abounding in them. It could not have been for the sake of food, as, from the fact of their dropping exhausted in the streets, that necessary article must have failed them, and if they sought an asylum from the weather, inland and less exposed places would have afforded them a better protection.

Quails, which migrate in the months of April and September, though supplied with an abundance of food in confinement, become restless and impatient towards evening at those periods. Some, which I succeeded in keeping for a lengthened time, invariably showed these symptoms, and were listless and heavy during the day, and lost flesh, but at the expiration of a few days they resumed their usual vivacity and plumpness. Some eggs, which I procured for a friend, were hatched under bantams, and the young birds in due time were turned loose. For a short period they kept near the house, but by degrees they wandered to the adjoining lands, where their call was heard till autumn advanced, when it ceased altogether, and the birds were nowhere to be found. That birds with such limited powers of flight, should, by an irresistible impulse, cross vast distances of sea, is indeed remarkable, and renders the idea that partridges occasionally cross the channel from France by no means ridiculous. I have known several instances of their having been caught alive and exhausted on the rocks by the sea-shore at Dover, and I kept for a long time two out of a whole covey which dropped into the court-yard of a house in the town. Now, as there are very few partridges in the neighbourhood of the town, and consequently but little shooting, they could hardly have taken refuge in those places, if flushed by a sportsman; and if a hawk had been in pursuit, they would not have trusted to flight, but would, with that instinct with which every animal is endowed for its preservation, have cowered down, and probably in some spot which assimilated to them in colour. As tending to confirm this opinion of partial migration, a solitary red-legged partridge was shot on the sand-hills near Sandwich, and there are none of that species in Kent, though they are common in Suffolk and Norfolk, where they have been introduced from France, to the great annoyance of the sportsman.

On the 4th October, 1841, on my passage across the North Sea from London to Copenhagen, we encountered a very severe gale, and during the course of it a quantity of thrushes and chaffinches, and a solitary robin, evidently migrating, took shelter in the rigging of the ship; and on the 10th of the same month, while in the Baltic, we had robbins, chaffinches, long tailed titmice, and golden crested wrens. They rested for a short time, and then worked off to the south, flying low as if almost touching the water. How few of these tiny wanderers must live to reach their destination, and how singular that they should commit themselves to a long and dangerous journey across a most stormy sea, when a more progressive and safer route by land to the borders of the North Sea is open to them! A passage too, not to be completed within the limits of one of the short days in that latitude, and where there could by no possibility be found food for them.

It is a common, but a very erroneous opinion, that the appearance of flights of wild geese and ducks on our coasts in the autumn prognosticates a severe winter. Such an event may happen, but it has no connection with this migration, which proves rather that the birds are driven from the north, by the rigours of winter having commenced, to seek food and shelter in our milder regions; and when it is borne in mind that the Elbe, the waters about Heliogoland, and the sands and flats on the Dutch coast, literally swarm at that season with wild fowl, it is not all surprising that some few birds of such wandering habits should cross to our shores. In very severe winters, we certainly do have an immense increase to the number of waterfowl on the coast, but then they are constrained to come because the cold is much more intense on the opposite side, and the sea is frozen many miles from the shore.

There is, however, one peculiarity, namely, that among the many varieties some few rarely visit us, although in the northern regions they are as plentiful as other species. Thus the *Anas glacialis* and the *mollissima*, the long tailed duck, and the eider, are rarely to be met with, while they are, as I noticed, equally abundant with other varieties in the Baltic, and in the Fiords of Sweden and Norway. The former I have even seen on the Neva, sporting in the stream between the bridges at St. Petersburg—and they were besides abundant in the markets—but the eider, being shyer and more difficult to approach, I never met with for sale.

The *Anas olor*, or mute swan, with which we are familiar in this country, is not an inhabitant of the northern regions, but his place is supplied by the *Anas cygnus*, or whistling swan, which is in great quantities both in a wild and domesticated state. The moment of their departure to the south is sudden and almost unseen, for, like other palmipedes, they make their great flight by night, but their return is distinct and marked. Previous to the breaking up of the ice in the Gulf of Finland in the spring of the year, they arrive in large flocks, and continue about its edges awaiting its total dissolution, when hundreds may be seen collected together feeding. They are wary and exceedingly difficult of approach, but I once had an opportunity of getting almost among them. I was shooting wild fowl in the gulf with a friend, one evening in the middle of May, in one of Colonel Hawker's punts carrying a large swivel gun, when, in the middle of our sport, we heard the distant hooping of swans. The inducement to follow was too great, and allowing our canoe to drift towards them, we could soon see that we were approaching a flock of at least one hundred and fifty birds, but, notwithstanding our precautions by lying on our faces, and suffering the boat to drift of its own accord almost, we could perceive that they were alarmed, and not being provided with swan shot, it was necessary that we should get as near as possible. At last they rose, and I fired, but none fell, though we plainly heard the shot rattle among them. It was beautiful to see them rise on the wing simultaneously, beating the water with their wings for many yards, and throwing up a complete spray before they were fairly in flight. The paddles of twenty steamers could not have made more noise; indeed the passengers in a steam boat, coming up the gulf at a great distance, distinctly heard the rush, without either seeing them or hearing the report of the gun. As the season advances, they disappear entirely for more northern parts for the purpose of breeding. At this season, snipe and woodcock shooting is in great perfection, particularly as they assemble at their breeding places. The former are by no means solitary in their habits, for hundreds of couples may be found in a morass of thirty or forty acres, and, as regards the latter, the sportsman need only station himself in the centre of a heath common towards evening, when the male birds are making their flights, uttering a kind of bleating sound.

Bewick is wrong when he states, that these birds "must have the instinctive precaution of landing only in the night, or in dark, misty weather, for they are never seen to arrive," in allusion to the period of their migrating to this country. That a vast quantity do arrive by night is undeniable, for the light-house keepers on the Kentish coast often pick them up dead in the morning, from their having flown against the lights and destroyed themselves—a proof of the rapidity of their flight; and it is a common custom for that dubious race of sportsmen termed gunners to pass under the cliffs at daylight to pick up those birds which, from fatigue, have been unable to clear the heights till they have rested. I have known fourteen couple to be killed of a morning. The birds prefer a moonlight night, with wind at north-east; and with the wind in that quarter, I have often seen them arrive in the day time. They fly rapidly, and in an undeviating straight line, and apparently regardless of obstacles. One was brought to me which was seen to fly against the banking-house of a firm at Dover, dead, and with its bill broken by the concussion. A bird evidently of unbusiness-like habits to present its bill in that fashion. Two others, at about the same period, flew so close over the heads of some soldiers on parade, that they involuntarily raised their muskets as they passed over them, to the scandal of the drill-serjeant.

Of all the phenomena connected with migration, one of the most astonishing is, that certain land birds leave us in the spring to nidificate in other countries,—a fact to be accounted for only, as I have before stated, by looking to higher causes. The regions of the East would, doubtless, supply the swallow with food inexhaustible throughout the year; the nightingale, and other warblers, would equally experience no difficulty in supplying their wants in those genial climes, and yet, urged by an irresistible and regularly recurring impulse, they launch forth on a wearisome and perilous voyage to fulfil their high mission. The same principle must apply to those birds which hybernate with us. The cone of the fir-tree is nearly as abundant as in the north, and yet the cross-bill, hawfinch, and chatterer leave us; berries are as plentiful, and still the fieldfare and redwing return in flocks. As regards the insectivores, I believe them to be commissioned by an all-wise and beneficent Providence to free us from the clouds of insects, which would otherwise infest our dwellings, and destroy the labours of the field; and how greatly do they add to our enjoyments and feelings of cheerfulness, by their beauty, motions, and melody! May not the return of the migrating birds to the north be designed for the same purpose, for how vast would be the abstraction from our enjoyments were our woods and hedge-rows silent and tenantless. If our more southern winter is gladdened and enlivened by these sportive and happy beings, the vernal and summer delights of the inhabitants of the less genial regions of the north are increased, and the privations of winter, in a manner, compensated for by their return.

Let the traveller leave a cultivated and wooded district to enter on a boundless waste, or an open plain, and he feels that he is moving a solitary being on its surface, and is indeed alone; but as he emerges from the dreary flat, life again presents itself, and his feeling of desolation is removed by the joyous twitter of the feathered creation. No one, who has read the narrative of Columbus' first expedition in search of the New World, can have failed to have noticed the effect which the first appearance of birds had on the minds of the disaffected and alarmed crew, while yet land was unseen. Harbingers of the New World, they were to Columbus what the dove was to Noah. Parties exploring in the interior of New South Wales have complained of an utter feeling of desolation, arising from the total absence of all animal life; and have experienced a painful oppression, from the unbroken silence which reigned around them. Sir Edward Parry describes, with feelings not to be mistaken, the vivid pleasure he felt at the appearance of two ravens, which presented themselves near his dreary abode, towards the close of the winter, on one of his Arctic expeditions.

Travellers in the north of France cannot but perceive the almost total absence of birds in that district. The country is open, and rarely broken by a hedge-row, and thus, shelter being denied them, they seek more favoured spots. The effect is as obvious as it is injurious, for there is no limit set to the ravages of the caterpillar, or the destruction of the grub. The *Pontia rapæ*, or small cabbage butterfly, swarms to an extent which must be seen to be believed. I have seen many hundreds on the wing at one time. The *Scarabæus melolontha*, too, flies in myriads, and there are no rooks to follow the plough.

The cuckoo, which collects about the coast before it takes its final flight towards the end of July, ceases its cry before that date. I find that it is totally silent by the 7th of July, and that for some days previously it utters a broken cry, repeating the first syllable several times, thus, cuc, cuc, cuc, cuc, cuckoo, in a hurried and confused manner, as if conscious of the irregularity, and attempting to correct itself. On these occasions it is always perched, while at other times it often cries while on the wing. The life and habits of the cuckoo are paradoxical, and this strange peculiarity in its note is not less so.

The Royston crow (*Corvus cornix*) alone, of all the land birds which migrate to this country, never leaves the coast to any great distance. Its appearance in any of the inland counties is never known.

The waxen chatterers, grosbeaks, and crossbills, rarely visit us except in the severest winters, and then they are by no means abundant, remaining principally, in their partial migration from the north, in the fir woods of Germany: they are most abundant in Russia, and are sold in large quantities in the markets, during the autumn, as an article of food, with bullfinches, crossbills, and even woodpeckers.

# THE ROBIN.

It is pleasing to see birds around us in a state of nature, and so divested of all fear that they seem to possess a consciousness that no injury would be offered to them. Few have this feeling, excepting during the period of incubation, but none more so than the Robin. Associated, as he is always, with our earliest and gentlest recollections, he is a stranger to persecution and cruelty, and sheltered, petted, and fed as opportunities offer, his intimacy is encouraged. But he has not that dependent and timid character which is often assigned him, and is far from seeking the dwellings of man for protection; on the contrary he is bold, fearless, and quarrelsome, arrogating to himself a little spot or district, within the limits of which he will allow none others of his species to intrude without offering the most violent opposition. Its combativeness on these occasions blinds it to its own safety, as I particularly witnessed in an affray between two of them at Margate. They fell foul of each other on the Parade, the most frequented part of the town, and after struggling on the ground together at the feet of the passengers, they rose in the air still continuing the conflict till they fell into the harbour, it being high tide. They were extricated by a boy, who took them up still clinging most pertinaciously to each other.

Another incident of a more singular nature occurred to myself at the close of September, 1835. I am particular in the date, as I have never noticed this pugnacity otherwise than in the autumn. In the case in point I heard a robin warbling in a tree in a small garden adjoining my house, and wishing to excite its attention, I placed on the window-sill a beautifully stuffed specimen of the bird, which was soon perceived. The song became louder and at longer strains as if sounding a challenge. Presently he made a flight of inspection as far as the window, which after an interval was repeated, but in the shape of an attack. So violent was it that he threw the stuffed bird to the ground from the height of two stories, pursuing it as it fell and attacking it violently when down. I then perched it on an empty box standing in the yard, the live bird remaining within a yard of me while I was doing so, and the moment I withdrew a few paces, he renewed the charge with redoubled vigour, and with such obstinacy that I could easily have caught him, and on my removing the stuffed bird he resumed his place on the box, strutting about with an expanded tail and an erect attitude, as if claiming and pronouncing a victory. Shortly after, on noticing the bird to be still hovering about the neighbourhood, I replaced my specimen on the window-sill, securing the stand by a brad-awl, and hardly had I done so before the robin resumed the war by settling on the head of his unconscious foe, digging and pecking at it with the utmost rage and violence. I then interfered and removed the object of strife, but the robin kept watch in the neighbourhood during the rest of the day, and was singing his triumph even in the shades of the evening.

The name "ruddock," given to this bird in some counties is evidently a corruption of the word redcock; while that of robin, given to him in the first instance by the country people, has remained as one of his synonymes. This class of the population have a habit of applying familiar epithets to their favourite birds, such as jenny wren, patty-washdish; while others are given in complete ignorance, as screech owl, meaning the swift, and goat sucker, the night jar—although the Latin name may be some authority in the latter instance.

Among such a numerous tribe of the creation, the quantity which perish from casualty and disease must be very great, and yet how rarely are dead birds found. That they retire moping into thickets and unfrequented spots, when injury or sickness has assailed them, is well known, and there they perish; but still that circumstance can account for only a small portion of the mortality. Moles, vermin, and many species of the coleopterous insects assist in the work which decomposition begins, and the total disappearance of the carcass is soon effected; but still we rarely find them even in this stage.

# EARLY MORNING.

The beauty of early morning, and the awakening of birds, is thus delightfully and characteristically sketched by Mr. Knapp.

"At one period of my life, being an early waker and riser, my attention was frequently drawn to the songs of earliest birds; and I also observed that those creatures appeared abroad at very different periods, as the light advanced. The rook is perhaps the first to salute the opening morn; but this bird seems rather to rest than sleep. Always vigilant, the least alarm after retirement rouses instantly the whole assemblage, not successively, but collectively. It is appointed to be a ready mover. Its principal food is worms, which feed and crawl upon the humid surface of the ground in the dusk, and retire before the light of day; and roosting higher than other birds, the first rays of the sun, as they peep from the horizon, become visible to it. The restless, inquisitive robin is now seen too. This is the last bird that retires in the evening, being frequently flitting about when the owl and bat are visible, and awakes so soon in the morning that little rest seems to be required by it. Its fine large eyes are fitted to receive all, even the weakest rays of light that appear. The worm is its food too, and few that move upon its surface escape its notice. The cheerful melody of the wren is the next we hear, as it bustles from its ivied roost, and we note its gratulation to the young-eyed day when twilight almost hides the little minstrel from our sight. The sparrow roosts in holes, and under the eaves of the rick or shed, where the light does not so soon enter, and hence is rather a tardy mover; but it is always ready for food, and seems to listen to what is going forward. We see it now peeping from its penthouse, inquisitively surveying the land; and should provision be obtainable, it immediately descends upon it without any scruple, and makes itself a welcome guest with all. It retires early to rest. The blackbird quits its leafy roost in the ivied ash; its chink, chink, is heard in the hedge; and mounting on some neighbouring oak, with mellow, sober voice, it gratulates the coming day. 'The plain song cuckoo gray' from some tall tree now tells its tale. The lark is in the air, 'the martin twitters from her earth-built shed,' all the choristers are tuning in the grove; and amid such tokens of awakening pleasure, it becomes difficult to note priority of voice. These are the matin voice of the summer season; in winter, a cheerless chirp, or a hungry twit, is all we hear; the families of voice are away or silent; we have little to note, and perhaps as little inclination to observe.

"During no portion of the day can the general operations of nature be more satisfactorily observed than in the early morning. Rosy June!—the very thought of an early summer's morning in the country, like enchantment, gives action to the current of our blood, and seems to breathe through our veins a stream of health and enjoyment! All things appear fresh and unsoiled. The little birds, animated and garrulous, are frisking about the sprays; others, proceeding to their morning's meal, or occupied in the callings of their nature, give utterance, by every variety of voice, to the pleasures that they feel; the world has not yet called us, and, with faculties unworn, we unite with them, partake of this general hilarity and joy, feel disposed to be happy, and enjoy the blessings around us; the very air itself, as yet uninhaled by any, circulates about us, replete with vitality, conveying more than its usual portion of sustenance and health; 'and man goeth forth unto his labour.' Night-feeding creatures, feeling the freshness of light, and the coming day, are all upon the move, retiring from danger and observation; and we can note them now unhidden in their lairs, unconcealed beneath the foliage in the hedge; the very vegetation, bathed in dew and moisture, full fed, partakes of this early morning joy and health, and every creeping thing is refreshed and satisfied. As day advances, it changes all; and of these happy beings of the early hour part are away, and we must seek them; others are oppressed, silent, listless; the vegetable, no longer lucid with dew, and despoiled of all the little gems that glittered from every serrature of its leaf, seems pensive at the loss. When blessed with health, having peace, innocence, and content, as inmates of the mind, perhaps the most enjoyable hours of life may be found in an early summer's morning."

# NESTS OF BIRDS.

It is difficult to conceive the motive or instinct which influences birds in the selection of spots for the construction of their nests, and the rearing of their young. With some it amounts to a kind of caprice; for while others of the same species, acting on the law of preservation, seek the safest and most retired places, they disregard the inherent principle of concealment and fear, and throw themselves boldly under the protection and kindliness of man. This applies, however, only to the locality selected; for however open and exposed it may be to view, yet the same materials are employed in the formation of the nest, as would be the case were it attempted to baffle the most diligent and prying search, either by concealment, or by the use of such materials as assimilate in colour and appearance with the surrounding objects. Parental instinct, which is displayed in so many different ways at this season of incubation, seems to be modified in these exceptions, and the habitual terror which seeks its safety in flight to be dispelled. A wild duck has been known to have its nest on the trunk of a pollard oak which overhung a public style. Flycatchers have built in the jessamine trained round a constantly frequented window; a thrush had its nest and reared its young in a low shrub within a yard of the scraper of a house door; and the robin even penetrates into houses, and avails itself of a nook in the curtains, or of a shoe in a closet; it has built under the awning of a waggon, which it has followed on its journey; and has even gone to sea in a ship, in the mast head of which it had constructed its nest. Thus with some birds the στοργη is so powerful, that not even the fear of capture or of death will shake it. The partridge is cut over by the scythe of the mower rather than forsake her eggs; and the raven, as described by White in his Natural History of Selbourne, submits to be beaten down by the branches of a falling tree, and to perish with her young. In the garden of a friend, we had often noticed a common titmouse disappear in the spout of a small iron pump, which was out of use; we removed the covering, and fixed on the hinge by which the handle was worked, we found a nest of young birds; the disturbance from our anxiety to watch the progress of the young must have been very great, but still the old birds continued their exertions to rear the brood, in which they succeeded, and finally contrived to get them down the spout when fit to fly. A partridge, which had her nest in a bunch of tangled grass and nettles by the side of a turnpike road, hatched her eggs, and got her young away in safety. The sparrow may also be considered as an exception of another kind, for although, from its hardihood, it might be supposed to build occasionally within reach, yet it never does so, but still makes no secret of its nest, forming it of such a superabundance of straw and hay that it is every where conspicuous, and is besides openly betrayed by the endless chattering of the birds themselves. Their usurpation of a martin's nest is proclaimed by their noise and restlessness, and this is, I believe, the only instance known, at least in Europe, of a bird deliberately and by force taking possession of the nest of another species, and which besides has no point of resemblance with its own. I have frequently seen their nests attached to those of the rooks, and crowded in numbers around the faggot-like structure of the stork.

The nest of the magpie is almost invariably built in the most exposed manner, generally on the summit of a tall thin sapling, which it is impossible to climb, but yet the nest has a kind of roof of thorns and brambles, as if for the purpose of protecting it from an invader; the weakness of the tree ensures it from any truant spoiler, and the bold character of the bird would repell any other adversary; why then the thorns, and why employed by this bird, and by none others?

The blackbird and thrush plaster the interior of their nests with a composition of cow-dung; it is a singular piece of economy, and probably employed to give ballast to the nest. The nests of most large perching birds are interwoven among, and strengthened by, the twigs and lesser branches of the trees in which they are built, and thus resist the wind, but the nest of the blackbird and thrush is merely laid, as it were, on a branch, and would be subject to all kinds of risks were not some kind of stability given to it by the weight of the plaster lining.

Early in June, 1842, I fell in with a large quantity of fieldfares, in a fir forest at Abo, in the Gulf of Bothnia. It was their breeding season, and I could descry their nests at the fork of the upper branches, where they emanated from the trunk. To reach them by swarming up the thick straight stem of a full-grown tree was impossible, but I was anxious to know the structure of the nest, which, from its position, I presumed might require the same ballast as the rest of the genus *Turdus*, should my theory be correct.

The wood pigeon occasionally builds on the ground: I have found its nest with young when shooting early in September, which would doubtless be the second brood.

The rook and crow do not begin to build their nests in Russia till the end of March—and even there, as with us, they are the first in the field.

With the exception of the martin and the stork, it is perhaps the only bird which retains a predilection for its old nest, which it revisits at intervals during the autumn to fortify and repair against the future season. Instinct in general is not prescient, but immediate; it is not acted on by calculations of events, but there is some exciting cause which calls it forth. In this economy of the rook, instinct assumes the character of forethought, common in some hybernating animals as regards their collection of food, but excelling them in this remarkable attention to the future wants of their progeny.

# HYBERNATION OF ANIMALS.

The hybernation of animals is a subject which furnishes us with the most ample grounds for reflection, and leads us to wonder, not only at the contrivances devised by the great Creator for the preservation of creatures we either despise or loathe, but to notice, with astonishment and admiration, the anticipating instinct and foresight which actuate them at certain periods of their existence; qualities which seem to approach the reasoning and calculating powers with which man, and man only, is endowed. Man, by the exercise of those powers, and the adaptation of the means supplied to him, protects, shelters, and supports himself, and such is his capability of endurance that the extremes of climate, and the vicissitudes of season, from the burning, sterile desert, to the dreary and inhospitable north, present no barrier to his existence. But with man this faculty ceases—all other created beings are subject to other laws. We read that no beings were created in vain, nor without some purpose, and that their existence was given them for some wise end. The chain of creation would not be perfect were one link to be lost; but this perfection of system could not be maintained amidst the vicissitudes of climate and of season without some wonderful arrangement of Providence, some contrivance by which life is preserved in opposition almost to the ordinary rules which govern it. Every object in the creation is stamped with the character of the infinite perfection and overflowing benevolence of its Author. If we attend to the vast concurrence of causes that join in producing the several operations of nature, we shall be induced to believe that the whole world is one continued train of causes and effects, in which all the other parts, either nearly or remotely, have necessary dependence on each other. Each part lends a certain support to the other, and takes in return its share of aid from them.

As the food of the insect world disappears when the autumn hastens to its close, so do many of the species retire into places of security and of shelter from the approaching inclement season, whilst almost simultaneously, the swallows, and other insectivores depending on them for support, wing their flight into distant and more genial climes. This slight illustration shows that the preservation of life with many of God's creatures depends on two points, namely, migration and hybernation. With the former of these it is not the object of the present paper to interfere, yet it is necessary, as an introduction to the latter, to make a few remarks respecting it.

Migration is confined almost entirely to birds, and, as with hybernation, it has the same object, but yet with this distinction, that with the one, life is continued amidst activity and cheerfulness, and with the other, under a suspension of its powers, in gloom, torpor, and unconsciousness. But in both instances a wonderful foresight is exhibited; the birds leave us anticipating the coming change, and the insect world retires to its fastnesses ere yet its means of existence are entirely removed. With the few migratory animals, however, the case is different, and of course from their formation less sudden. The musk ox and rein-deer, for instance, denizens of the north, travel south in large herds only in proportion as they are propelled by the rigours of winter, and the consequent failure of food. But all animals are calculated in every respect and in the best possible manner for the climates in which they reside, and for their separate and peculiar modes of life. What art, however, does for man, nature has in many instances done for those animals which are incapable of art. Their clothing of its own accord changes with their necessities. In the bleak regions of the north, most of the non-migratory animals become white, to evade, by their resemblance to the prevailing colour of the country, the quick sight of their enemies. Their clothing also becomes during winter nearly double what it is in summer. This is particularly the case with that large tribe of quadrupeds which are covered with furs; and even the feet of some birds are garnished with feathers, not only to protect them, but to enable them more readily to move on the snow.

The changes in the quantity and colour of their clothing, which almost all polar animals undergo with the change of seasons, is one of the most remarkable and beautiful provisions of nature. The fur, wool, and feathers, with which quadrupeds and birds are covered, is regulated generally, as to its quality and quantity, by the temperature of the region which the animal inhabits. The dogs of Guinea, the Indian sheep, and the African ostrich, are so thinly clothed that they may be considered almost naked. The temperature of their bodies is thus necessarily diminished in proportion to the heat of the climate in which they live. The Iceland sheep and the Esquimaux dog, on the contrary, are covered with a warm coat, both of hair and wool, which enables them to bear the most intense cold without much inconvenience. Previous to winter, the hair of all animals is increased in quantity and length; and the more they are exposed, the greater is the increase. Horses and cows, housed during the winter, have short and thin hair in comparison with those exposed to the weather, whose coats become shaggy. The groom is aware of this arrangement of nature, and he redoubles his labour in winter to give his horse a fine coat, and thus to render him unfit for exposure to the cold. The agents of the Hudson's Bay Company, who annually transmit to Europe many thousands of the most valuable furs, will only purchase of the Indians with whom they traffic those which are obtained during the winter. The furs of those animals which are killed in the summer are quite unfit for the purposes of commerce, and they are also of inferior quality early in the winters of unusual mildness. The growth of the hair is dependent upon the temperature of the atmosphere; and thus the skins of hares and rabbits with us are seldom ripe in the fur, as it is called, till frosty weather has set in. The moulting of birds, which takes place previous to winter, after their young are reared, is a similar provision of nature. By the renewal of the feathers, a sufficient covering is afforded to enable them to bear the approaching change of season.

The changes of colour in many of the polar animals, and in others with which we are more familiar, though an undisputed fact, is not generally understood as proceeding from the same principles of adaptation to the change of season as the increase in the quantity of their clothing. The alpine-hare, which is found in Scotland, is in summer of a tawny grey, while in winter it is of a snowy white. The ermine, which is also found in the British islands, has its summer coat of a reddish brown, but in winter it affords the beautiful white fur, which is so generally known, and with which the robes of our judges are adorned. The plumage of the ptarmigan, a bird of the grouse species, which breeds in Scotland, is of an ash colour with dusky spots in summer, and of a pure white in winter. The rapidity with which the colours change, and the extent of the alteration, in these examples and in other animals, always depend upon the severity of the season. But the advantage of the change, whether it be complete or not, is sufficiently evident when we take into consideration a well-known philosophical principle. Every one is aware that in summer a black hat produces a much stronger sense of heat to the wearer than a white one.

The same thing occurs to animals of a black and white colour. If they are placed in a higher temperature than that of their own bodies, the heat will enter the one that is black with the greatest rapidity, and elevate its temperature very much above that of the other. When these animals, on the contrary, are placed in a situation where the temperature is considerably lower than that of their own bodies, the black animal will give out its heat by radiation to every surrounding object colder than itself much more quickly than the white animal. The surface which reflects the heat most readily, as in objects of a white colour, suffers it to escape but slowly by radiation; and it is for this reason that the white animal has its temperature reduced most slowly in the winter. The change of colour in the clothing of some quadrupeds and birds exposed to severe cold, as well as the increase in the quantity of their outward protection against its effects, forms one of those beautiful provisions of the Author of Nature which we recognise in every examination of his works, but which we sometimes overlook in our hasty notice of ordinary appearances, without regard to the causes from which they spring. This whiteness of the fur, then, enables the animal to bear the diminished temperature without such a diminution of the warmth of the body as would deprive him of his physical powers ; and it is remarkable that these extraordinary adaptations of the body to climate are confined to the inferior animals. Man is not affected by them. It may be concluded from this circumstance that he, in the cases of adaptation to climate, as in all others, is left to derive his protection against physical evils from the exercise of his own reason. The poor Esquimaux, during their intense winters, clothe themselves with thick furs, shut themselves up in a hut of snow (the warmest of coverings from the external air), make fires, and obtain light from oil. Man therefore has a defence, in his superior intelligence, against the rigours of climate even in the most exposed situations. He is left to the unaided care of this intelligence, without that special intervention of Providence which makes such arrangements for the preservation of the inferior animals as shall come to the aid of their instinct, and stand in the place of those comforts which may be obtained by the higher faculties of the human race. Man, for instance, is the only animal that can produce artificial light and heat. He makes a fire in the woods, and the monkeys will warm themselves at it, but no monkey ever yet succeeded in kindling a fire itself. As man advances in civilisation, these broad distinctions may be overlooked in the elaborate contrivances by which he heaps up every comfort and luxury around him; manufactures and commerce ensuring the possession of them in various degrees to all the human race. But the ability to construct a steam-engine, and the knowledge which shows how to kindle the fire which sets that machine in motion, are equally results of the superior intellect of man, as distinguished from the faculties of the creatures beneath him. "Consider the lilies of the field, how they grow; they toil not, neither do they spin." The lilies of the field derive their exceeding beauty, without an effort, from the hand of the God of Nature; but the same God ordains the toiling and spinning for man, to enable him to preserve that place in the creation to which he is destined—the head of all beings inhabiting this earth—by the constant and progressive exercise of his reasoning faculties, and by the employment of that knowledge which, from the accumulated experience of past generations, constitutes the power of civilisation.

So powerfully do these laws act, and so perfect is the arrangement of Providence over these its creatures, that both artifice and skill have alike failed in changing their natures, and even in preserving life in opposition to the governing principle. The imprisoned quail, though abundantly supplied with food, becomes restless and lean when its usual period of migration arrives, and not unfrequently destroys itself in its violent and unceasing efforts to escape. The swallow, with the exception of one or two solitary instances, notwithstanding the attention to temperature, and to the cage and perches being lined with flannel, has never survived a winter in this climate. Nor has it ever been discovered that it, or any other animal subject to the laws of migration, has the means of adapting itself to the climate or the severity of winter. Absurd and fabulous statements have been handed to us, and even now gain some belief with the credulous, that as winter approaches swallows conceal themselves in hollow trees, and even plunge into the water, where they lie, clustered together in heaps, awaiting the genial return of spring. The internal formation of the bird would, on examination, disabuse the mind of the greatest sceptic on the subject, but the common observer would be almost satisfied by the wonderful activity and power of flight displayed by this bird, for it may be fairly questioned whether, among the whole feathered tribes which Heaven has formed to adorn this part of the creation, there be any that, in the same space of time, pass over an equal extent of surface. Endowed almost with the speed of light, it can pass in a few days, and at will, from the borders of the Arctic regions to the torrid zone; and yet we are informed upon the authority of Spallanzani, that it is forced, when winter approaches, to descend to the bottom of lakes, rivers, and millponds, to bury itself in the mud with eels, or to creep ingloriously into a cavern or hollow tree, there to doze till the return of spring. Geese and ducks are acknowledged to be migratory, and to pass to southern regions at the approach of winter, but the swallow alone, on whom the Creator has conferred superior powers of wing, must sink in torpidity to the bottoms of streams, or doze through the winter in the caverns of the earth. Such absurdities are unworthy of serious refutation. What person would presume to assert that there exists nations, people, or individuals, all of whom, old and young, at the commencement of cold weather, descend to the bottom of their lakes and rivers, and there remain till the breaking-up of the frost; that they had lain torpid all the winter and had been brought comfortably to themselves again by the reviving influence of spring? Is then the organisation of a swallow less delicate than that of a man? Can a bird, whose vital functions are destroyed by a short privation of pure air and its usual food, sustain, for six months, a situation where the most robust man would perish in a few minutes? Cast a swallow into the bright summer stream and it perishes immediately; has then the chilled and wintry water such peculiar properties that it ceases to be destructive? or can the constitution of the bird adapt itself to another element?

Perhaps the only real instance we have of an animal positively adapting itself to this climate, and exercising a power of instinct approaching almost to reason itself, is exhibited in one of the most abject of creatures, the land tortoise, a native of the torrid zone, an animal so extremely susceptible that it will even seek shelter from a shower of rain, and which, sentient of the approaching change of season, prepares and scoops for itself, with indefatigable industry, a hole in the earth, where, protected from the frost and severity of winter, it awaits, in security and torpor, the reviving influence of spring; and such is its sagacity, that it is not deceived by any of the occasional fine and warm days which visit us before that season has permanently set in, but only crawls forth to light and life again when the dominion of winter has entirely ceased.

There seems to be some analogy between the birds that migrate annually to warmer climates to pass the winter, and those animals which, remaining in a country, seek a subterranean or other close retreat to shelter them from the rigours of that season, and in which they continue in a torpid state till spring revives them, and they issue from their hiding places to fulfil the first law of their Creator. It has been nowhere observed, that hybernating animals are regulated by the temperature as to the season at which they prepare to retire for the winter, except as to insects, which, with few exceptions, are of that description. Mr. Spence, in his introduction to Entomology, has some remarks on this subject which seem at first sight to prove that the disappearance of insects, at least those of the order Coleoptera, or beetles, is not preceded by any remarkable lowering of the temperature; on the contrary, he observed a great number of various genera congregating with this view when the thermometer was 58° in the shade. This was about the middle of October. But there is one circumstance to which he has not adverted, which may tend to reconcile the fact with the received opinion. The nights at that time of the year are often cold when the days are hot, the latter also are much shortened and the former lengthened, so that the sum total of heat received from the sun is very much diminished, which may be the exciting cause of their hybernating at this time, when the diurnal temperature is considerable. This seems so reasonable, and so reconcilable to our ideas of causes and effects, that we might at once pause from further inquiries and theories, and congratulate ourselves on the solution of the problem; but a moment's reflection throws us back upon our ignorance, and we are bound to acknowledge that although this may be a reason, yet it is not the exciting cause; for why do some birds, such as the swift and cuckoo, migrate while yet the season is in its prime?

If we give to the subject of the migration of animals due consideration, and reflect what would be the consequence if no animals ever changed their quarters, we shall find abundant reason for thankfulness to the Almighty Father of the universe for the care he has taken of his whole family, and of his creature man in particular, consulting not only his sustentation, and the gratification of his palate, by multiplying and varying his food, but also that of his other senses, by the beauty, motions, and music of the animals that are his summer and winter visitors: did the nightingale forsake our groves, the swallow our houses and gardens, the codfish, mackerel, salmon, and herring our seas, and all the other animals that occasionally visit us their several haunts, how vast would be the abstraction from the pleasure and comfort of our lives! By means of these migrations, the profits and enjoyments derivable from the animal creation are also more equally divided, at one season visiting the south and enlivening their winter, and at another adding to the vernal and summer delight of the inhabitants of the less genial regions of the north, and making up to them for the privations of winter. Had the Creator so willed it, all these animals might have been organized so as not to require a warmer or a colder climate for the breeding or the rearing of their young; but his will was that some of his best gifts should thus oscillate, as it were, between two points, that the benefit they conferred might be more widely distributed, and not become the sole property of the inhabitants of one climate. Thus the swallow gladdens the sight both of the European and the African; and the herring visits the coasts, and the salmon the rivers, of every region of the globe. What can more strongly mark design, and the intention of an all-powerful, all-wise, and beneficent Being, than that such a variety of animals should be so organized and circumstanced as to be directed by some pressing want to seek distant climates, and after a certain period to return again to their former quarters; and that this conduct should be productive of so much good to mankind, and at the same time be necessary, under its present circumstances, for the preservation or propagation of the species of these several animals.

Having thus glanced at migration, which, as far as this country is concerned, belongs peculiarly to birds, the question of *hybernation* presents itself. This may properly be divided into two points, namely, the positive and comparative state. The positive implying an actual and unbroken state of torpor, and suspension of all the vital powers, the comparative signifying, as the word expresses, a less-decided and violent condition, embracing those animals which maintain themselves by food stored up in season to meet the exigencies of winter. And here the wonderful and beneficent hand of Providence is especially manifested. We know that in winter the insect world, the food of many animals, such as the bat, is no longer visible; that certain fruits, the maintenance of others, have with the advance of season perished, and that the earth, exhausted by its efforts to supply all creation, dormant, and recovering fresh energies, no longer yields the flowers and plants so essential for the support of other creatures. As with the fruits of the earth, therefore, so would also an endless variety of animals be lost, but for the gracious and all protecting care of their Maker, who willeth not that a sparrow should fall to the ground, and who has endowed them with the faculty to foresee the moment of danger, with the power to resist in torpor and concealment the pangs of hunger and of cold. But this privilege is denied to other animals, whose food, though no longer to be found as at other seasons, consists of the hard and less perishable produce of the earth, and to them it is ordained that they shall lay up stores or magazines of nuts, acorns, and the bark of trees for their sustenance during their semi or comparative state of hybernation. The positive state would be to them unnecessary, from the fact of their food being capable of being preserved, but then their wants are to a great extent limited, as most of their time is spent in sleep; and it is curious to think, that, connected with the foresight necessary to make their provisions, there must be also a calculation formed of the quantity adequate to the winter's consumption of the animal. Man in his wisdom, and with his reasoning and mental faculties, could do no more. It is not, therefore, cold or the effects of season, but the threatened absence of food incident to such season, which influences animals to hybernate. If it were cold and the rigours of winter, the poor wren would hardly remain exposed to its severities; a bird, the smallest of our residents, whose song is continued unconcerned even during a fall of snow, and whose body seems incapable of resisting even the slightest blast.

We are informed that the Esquimaux and North American Indians endeavour, through sleep, to drive off and deaden the paroxysms of hunger, but this of course can be but a temporary relief. Possessed of the most uncurbed and licentious passions, they are guided only by the impulse of the moment, and live only for the day; experience and their own reasoning powers having as yet failed to prove to them that simple principle of domestic economy,—the care of to-morrow. The great Creator has endowed all his creatures with peculiar attributes, but man in his uncivilized state is alone regardless of them, and it would be wrong to impute blame to the wild savage—the child of Nature—for his ignorance in these things, since his mind is as dark and undefined as chaos. But man with a reasonable soul, of whom it was said after the fall of our first parents, "in the sweat of thy face shalt thou eat bread," is left to his own powers and resources for maintenance, shelter, and protection, while to the inferior animals of the creation, an instinct of a miraculous nature, approaching almost to reason, has been bestowed. To collect provisions for their future use, to hoard them in safe places, and to use them gradually for their daily sustenance, are actions in the human race, which display and require great prudence, foresight, just reasoning, will acting upon judgment, and much self-command. A very large portion of mankind will not exert either their forethought or the self-government that alone makes it effectual. Mind in any one can only make itself visible to others by its works and actions, and it is so with all power, and all moral and intellectual qualities. The living figure of a Milton, a Raphael, or a Newton, could not reveal to us by its presence alone either of their intellectual productibilities. Each had to put these into action, in making external things that would display them, before others could know their admirable talents. So the divine Creator makes his inexhaustible potentialities more and more sensible to us, the more he varies and multiplies his gifts. Every fact enlarges our conception of his powers, by presenting additional sensations to our minds of its self-displaying effects.

Hybernation, then, is a visible proof of the direct agency of God, and it would also appear that his great object is the employment of the various tribes of animals to do the work for which he created them at its proper season; and where the object is particularly to keep within due limits the growth of plants, or to remove dead or putrescent substances before they generate miasmata, we may conjecture that when their services are not wanted they would be allowed a season of repose, so that during winter with us, when there is little or no vegetation of the plant, and a hot sun does not cause putrescent substances to exhale offensive effluvia, the great body in these departments are allowed to retire for a time, till their labours are again necessary. So also in tropical countries, where drought and heat united are sufficient to do the work of Nature's pruners and scavengers, by stopping vegetation, and immediately drying up animal and other substances before putridity takes place, they then abstract themselves and retire to concealment for a time; but when the rainy season revives the face of nature, they return each to exercise its appointed function at the bidding of its Creator.

All these circumstances indicate an analogy between certain phenomena observable in the history of plants and some of the instincts of animals, and tend to prove that the proximate cause of both may be very nearly related, and that as the immediate cause of the vegetable instinct is clearly physical, so may be that of the animal. With regard to all actions in the latter which are the result of intellect, they of course are produced by some principle residing within, as when the senses guide it, or the memory prompts it, and these aid it in following the impulse of instinct. The greatest of modern chemists has observed, with respect to some such agent, that the immediate connection between the sentient principle and the body may be established by kinds of ethereal matter, which can never be evident to the senses, and which may bear the same relation to heat, light, and electricity, that these refined forms or modes of existence bear to gases. It may be observed that the further any matter is removed from our knowledge and coercion, the more powerful it really is. Thus liquids are more powerful than solids, gases than liquids, imponderable fluids than gases, and so we may keep on ascending till we approach the confines of Spirit, which lead us to the foot of the throne of the Deity himself. Dr. Henry Moor, a very eminent philosopher and divine of the 17th century, under the name of the *Spirit of Nature*, speaks of a power between matter and spirit, which he describes as—"a substance incorporeal, but without sense and animadversion, pervading the whole matter of the universe, and exercising a plastical power therein, according to the sundry predispositions and occasions in the parts it works upon, raising such phenomena in the world, by directing the parts of matter and their motion, as cannot be resolved into mere mechanical powers, which goes through and assists all corporeal beings, and is the vicarious power of God upon the universal matter of the world. This suggests to the spider the fancy of spinning or weaving her web, and to the bee of the framing of her honeycomb, and especially to the silkworm of conglomerating her both funeral and natal clue, and to the birds of building their nests and of their so diligently hatching their eggs."

If such may be the powers by which the soul moves the body, and produces those actions that are in our own power to do or not to do, depending upon the will, does it seem incongruous that light, heat, and air, or any modification of them, upon which every animal depends for life, breath, nutrition, growth, and all things, should be employed by the Deity to excite and direct them, where their intellect cannot, in their instructive operations? That their organization, as to their instruments of mastication, motion, manipulation, &c. has a reference to their instincts, every one owns; can we not therefore conceive that the organization of the brain and nervous system may be so varied, and formed by the Creator, as to respond to pulses upon them from the physical power of Nature; so as to excite animals to certain operations for which they were evidently constructed in a way analogous to the excitement of appetite?

This principle is fully borne out and proved, by the manner in which each genus of the hybernating animal sets about its task, and prepares itself for this important passage in its existence. This impulse is the more extraordinary in those animals which live in associated companies, and which by showing a co-operating action for one common end, —an intention, a desire to unite their efforts for one purpose,—prove a settled design, a contriving mind, and a power of communication which might almost be presumed to belong to human beings only.

The bobac, a species of marmot, is gifted with a singular instinct, on account of which it might be called the *Haymaker*, since man may or might have learned that part of the business of the agriculturist, which consists in providing a store of winter provender for his cattle, from that industrious animal. Professor Pallas was the first who described the quadruped exercising this remarkable function, and gave an account of it. These animals make their abode between the rocks, and during the summer months employ themselves in making hay for a winter store. Inhabiting the most northern districts of the old world, the chain of the Altaic mountains, extending from Siberia to the confines of Asia and Kamschatka, they never appear in plains or in places exposed to observation, but always select the rudest and most elevated spots, and often the centre of the most gloomy and at the same time humid forests, where the herbage is fresh and abundant. They generally hollow out their burrows between the stones and in the clefts of the rocks, and sometimes in the holes of trees. About the middle of August they collect with admirable precaution their winter provender, which is formed of select herbs, which they bring near their habitation, and spread out like hay. In September they form heaps or stacks of the fodder they have collected under the rocks, or in other places sheltered from the rain and snow. Where many of them have laboured together, their stacks are sometimes as high as a man and more than eight feet in diameter. A subterranean gallery leads from the burrow below the mass of hay, so that neither frost nor snow can intercept their communication with it. Pallas had the curiosity to examine this provision of hay, piece by piece, and found it to consist chiefly of the choicest grasses and the sweetest herbs, all cut when most vigorous, and dried so slowly as to form a green and succulent fodder; he found in it scarcely any ears or blossom, or hard and woody stems, but some mixture of bitter herbs, probably useful to render the rest more wholesome. These stacks of excellent forage are sought out by the sable hunters to feed their harassed horses, and the natives of that part of Siberia pilfer them for the subsistence of their cattle. Instead of imitating the foresight and industry of the bobac they rob it of its means of support, and so devote the animal, which set them so good an example, to famine and death.

But no animals in this, or indeed any other order of Mammalia, are so admirable for their instincts and their results as the beavers. From the breaking up of the frost to the fall of the leaf, they desert their lodges and roam about unhoused and unoccupied by their usual labours, except that they have the foresight to begin felling their timber early in the summer, for the buildings which they begin some time in August. Those that erect their habitations in small rivers or creeks, in which the water is liable to be drained off, provide against that evil with wonderful sagacity, by forming a dike across the stream in almost a straight line where the current is weak, but curving more or less, with the convex side exposed to the stream, where it is more rapid. They construct these dikes or dams of the same material as they do their lodges, namely of pieces of wood of any kind, of stones, mud, and sand. These causeways oppose a sufficient barrier to the force both of water and of ice; and as the willows, poplars, &c. employed in constructing them often strike root, they become in time a green compact hedge. Cartwright says, that he occasionally used them as bridges, but not without wetting his feet, as they are level with the water. By means of these erections the water is kept at a sufficient height, for it is absolutely necessary that there should be at least three feet of water above the extremity of the entry into their lodges, which otherwise would be entirely closed in the hard frosts. The entry is not on the land side, because such an opening might let in the wolverine and other fierce beasts, but towards the water. The number inhabiting one lodge seldom exceeds four old and six or eight young ones; the size of their houses therefore is regulated by the number of the family. Though built of the same materials, they are of much ruder structure than their causeways, and the only object of their erection appears to be a dry apartment to repose in, and where they can eat the food they occasionally get out of the water. It frequently happens, says Hearne, that some of the large houses have one or more partitions, but these are merely part of the building left to support the roof. He had seen one beaver lodge, that had nearly a dozen apartments under the same roof, and, two or three excepted, none of them had any communication except by water. Cartwright says, that when they build, their first step is to make choice of a natural basin, of a certain depth, where there is no rock; they then begin to excavate under water at the base of the bank, which they enlarge upwards gradually, and so as to form a declivity till they reach the surface; and of the earth which comes out of this cavity they form a hillock, with which they mix small pieces of wood and even stones: they give this hillock the form of a dome from four to seven feet high, from ten to twelve long and from eight to nine wide. As they proceed in heightening, they hollow it out below, so as to form the lodges which are to receive the family. At the anterior part of this dwelling, they form a gentle declivity terminating at the water, so that they enter and go out under water. The hunters name this contrivance the *angle.* The interior forms only a single chamber resembling an oven, and at a little distance is the magazine for provisions. Here they keep in store the roots of the yellow water-lilly and the branches of the black spruce, the aspen, and birch, which they are careful to plant in the mud, and these form their subsistence. Their magazine sometimes contains a cartload of these articles, and the animals are so industrious that they are always adding to their store.

There is a species of beaver found in the great rivers of Europe—the Danube, the Rhine, the Rhone, and the Weser—which has been regarded as synonymous with the beaver of Canada, and which, though it forms burrows or holes in the banks of those rivers it frequents, does not, like them, erect any lodges as above described. Does this instinct sleep in them, and require a certain degree of cold to awaken it, or are they a distinct species? Linnæus mentions it in Lapland, where the cold is certainly sufficiently intense, and Cuvier seems uncertain whether it ought to be considered as distinct. Beavers seem formerly to have existed in England; the town of Beverley in Yorkshire (Beaver-field) appears to have taken its name from them, and its arms are three beavers.

Such are the principal operations that these wonderful animals (probably from the mixture of intellect with instinct) are instructed and adapted by their Creator to execute, that man, by studying them and their ways, may acknowledge the power, wisdom, and goodness that formed and guides them.

The common squirrel makes a nest of moss and dried leaves at the fork of the branch of a tree, with two holes at opposite sides, and as the wind varies, shuts the hole towards it. It lays up magazines of nuts, acorns, fruits, and berries for winter. It places these in the hollow of the tree, never touching them till wanted. The larger American squirrel puts its store under ground. The ground species in Canada never willingly ascends trees, but makes its burrows under the earth, with long branched galleries leading to several apartments, in which it deposits maize, acorns, nuts, and chestnuts, all in separate chambers for its winter food.

The field-mouse collects large stores of grain, nuts, acorns, and beech-mast in its places under ground, but the hogs, by their exquisite scent are often led to their hoards and root them up. The Siberian mouse makes similar collections of garlic roots, which it is fond of. The economic mouse of Kamschatka forms magazines of bulbous roots under the turf, which it lays out to dry on sunny days, and never touches but in winter. The German Hamster rat makes large chambers for grain, beans, pease, and linseed, each in a separate cell, sometimes a hundred pounds weight in the whole. The dormouse and brown rat have the same habit. The jerboa also collects the finest herbs in her subterranean burrows. The Kasan marmot, and the Zemni or Podolian one which pervades Asia, do the same. Each individual has its separate burrow, in which, for provision, in the beginning and end of winter (for in the winter it lies torpid) it lays up magazines of tender vegetables, and berries, sometimes adding mice, and small birds; but of all these animals the Hamster rat is the most extraordinary, and at the same time the most destructive. In order to facilitate the transportation of food to their magazines, they are furnished with pouches in their cheeks, which are of sufficient capacity to hold each about two ounces of grain. Dr. Russell, in dissecting one of these animals, found the pouch, on each side of its mouth stuffed with young French beans, arranged lengthways, so exactly and close to each other, that it appeared strange by what mechanism this had been effected ; for the membrane which forms the pouch, though muscular, is extremely thin, and the most expert fingers could not have packed the beans in more regular order. When they were laid loosely on the table they formed a heap of greater bulk than the animal's body. In some years the Hamsters are so numerous that they occasion a dearth of corn by their devastations. In one year 11,000 skins, in a second 54,000, and in a third 80,000 were brought to the town-house of Gotha, as vouchers of claims to the rewards allowed for the destruction of the animals in that neighbourhood.

The above are a few of the animals which pass the winter in a comparative state of hybernation, and sufficiently prove the care of Providence for its creatures, and illustrate some of the most remarkable instances of instinct which actuate the brute creation.

The phenomena of hybernating animals, which grow dull on the approach of winter, and at length fall asleep, continuing so till the return of mild weather, and generally endeavouring to be as little exposed to noise, motion, and all causes of excitement, and to lose as little heat during the approaching cold as possible, by coiling themselves up and getting into holes and warm situations, covering themselves with leaves, &c. are perfectly analogous, though very different in degree, to those of common sleep. The sensibility and all the functions are lessened, the temperature becomes nearly as low as that of the surrounding medium, the circulation slow, respiration almost or quite imperceptible, and digestion suspended. Although all activity is thus reduced in the hybernating state, vitality becomes more tenacious, and is less easily extinguished. Mangili cut off the head and neck of a marmot in the state of hybernation in March, and put it in spirits, yet movements were evident in it at the end of half an hour, and galvanism produced strong contractions in pieces of voluntary muscles three hours after they had been cut off, and even four elapsed before the excitability was much diminished ; the heart also beat for three hours after decapitation. He made the same examination in June, with a marmot which had been out of hybernation two months : the muscles showed little excitability under galvanism at the end of two hours, and the heart ceased to beat fifty minutes after decapitation. The augmented tenacity of life, which allows food, air, and heat to be dispensed with in whole or in part, is likely to pervade the muscles, and indeed every part of the frame, just as the necessity for air, food, and heat is in all other cases proportionate to the want of tenacity of excitability in muscles, and of all vital properties. The sensibility is not so diminished but that the slightest touch applied to one of the spines of the hedgehog immediately roused it to draw a deep and sonorous inspiration, and the merest shake induced a few respirations in the bat.

This torpidity is produced by a deficiency of external excitants, usually by cold and want of food, and, in the language of Brown, is a state of direct debility; while our ordinary sleep is one of indirect debility,—namely, exhaustion. No structural peculiarity is discoverable which enables certain animals to exist in the torpid state.

Such animals at all times produce less heat, and vary more with the surrounding medium than others; so that Dr. Edwards in an hour cooled a dormouse 36°, by surrounding it with a freezing mixture, which caused a reduction of not more that 5° or 6° in adult birds and guinea pigs, exposed to it for even a longer time. Some which do not hybernate resemble them in this inferior power—mice, for example,—which therefore at all ages and seasons make themselves nests. On the other hand, hybernating animals are not all equally deficient in the power of resisting the influence of surrounding low temperatures,—dormice are the most so, marmots the least,—so that animals which preserve their own temperature in low media and those which readily follow the surrounding temperature are not widely separated, but insensibly run into each other, to say nothing of the inferior power of the newly born among many of the former, and among all if born before full time, and of the various degrees of this power in different adults, and in all at different seasons of the year. Cold produces sleep in all;

and if this sleep be indulged, death is the result in those which cannot hybernate ; while those which can, become more and more torpid by the mere continuance of the same degree of cold. A very intense degree of cold has been found actually to arouse animals in a state of torpidity, but the excitement of the functions could not continue long, and death ensued. It appeared necessary that respiration should be suspended in an experiment by Dr. Saissy, who by mere cold could not produce torpor in a marmot, till he closed the lid of the vessel in which it was placed. Hence exposure to carbonic acid, hydrogen, &c., in this state was found by Spallanzani to have no ill effect upon a torpid marmot. Yet respiration has often seemed not to cease entirely. The blood has been found in a certain degree coagulated in torpid bats. Cold at any time of the year will produce the torpid state, but want of food must greatly assist in lessening the power of maintaining temperature. On the other hand, a continual good supply of food and warm temperature increase the power of evolving heat, and enable animals to resist the power of cold, so that by domestication some cease to hybernate in the winter. Dr. Edwards found that the temperature of hybernating animals sinks considerably during sleep even in summer.

In hybernating animals voluntary motion is altogether suspended, so also is the process of digestion ;

several of the secretions are suspended, the senses are likewise sealed up, and the circulation is diminished. The Hamster rat, in which the pulse beats one hundred and fifty strokes per minute in a state of activity, has it reduced to fifteen in its torpid condition. The dormouse, whose pulse is so rapid as scarcely to be counted when in its ordinary state, has it reduced to the same low standard when torpid.

Respiration is also affected in a remarkable degree, not only in the number but in the fulness and regularity of recurrence. Marmots in a state of health and activity perform about five hundred respirations in an hour, but in the torpid state these occur only fourteen times in the same period, and then only at intervals of four or five minutes' absolute pause: neither is the chest enlarged to any considerable extent.

Irritability is much diminished; parts of their limbs may be cut off without the animal showing any signs of feeling. When the Hamster is dissected in this condition, the intestines discover not the slightest signs of irritability on the application of stimulants. During the operation, the animal occasionally opens its mouth as if it wanted to respire, but the lethargy is too deep to admit of its being roused. Those functions on which animal heat more immediately depends,—namely, the circulation of the blood,—those changes which effect its conversion from arterial to venous, and the process of breathing, are carried on in a very subdued manner; the resulting temperature is accordingly low. The summer temperature of the hedgehog is 100°, in a state of torpidity it is only 44°; but it is always from 3° to 4° higher in the central parts of the body than on the surface. The ordinary heat of the marmot is 102°, but during hybernation only 43°. Hybernating animals thus present to us a very remarkable modification of organization; at one season, when in a state of full activity, supporting animal heat at its highest point; but being incapable of sustaining the vital warmth in opposition to low external temperature, they are thrown into a particular condition, in which life however is not extinguished, but remains dormant, in many instances for months.

At the end of autumn, from the abundant supply of food which most of them are able to procure, they retire to their winter retreats loaded with fat. This serves as a reservoir of nourishment, sufficiently adequate to the supply of the small expenditure that takes place during their torpid state. On the genial return of spring they are roused from their lethargy, the fat being generally wholly expended.

Fishes and other cold-blooded animals will survive an intense torpidity. "The fish froze," says Captain, now Sir John Franklin, in the Narrative of his Journey to the Polar Sea, "as fast as they were taken out of the nets, and in a short time became a solid mass of ice, and by a blow or two of a hatchet were easily split open, when the intestines might be removed in one lump. If in this completely frozen state they were thawed before the fire, they recovered their animation. We have seen a carp recover so far as to leap about with much vigour after it had been frozen for thirty-six hours." The celebrated Isaac Walton quotes Gesner for the fact of some large breams being put into a pond, which was frozen the next winter into one mass of ice, so that not one could be found, and they were all swimming about again when the pond thawed in the spring,—a thing "almost as incredible," says the sentimental sinner, as Lord Byron calls him, "as the resurrection to an Atheist."

Insects easily bear torpidity from cold. In Newfoundland, Capt. Buchan saw a frozen lake, which in the evening was all still and frozen over, but as soon as the sun had dissolved the surface in the morning, it was in a state of animation, owing, as appeared by close inspection, to myriads of flies let loose, while many still remained infixed and frozen round. Ellis also mentions that a large black mass, like coal or peat, dissolved when thrown upon the fire into a cloud of musquitoes. Those insects which hybernate are not thought to prepare for and enter into that state solely from cold, as they do so when the season comes round, although the weather be as warm previously, and they show no disposition before this period, though the temperature chance to be as low as it usually is in the season of hybernation.

Some animals become torpid on being deprived of moisture; the most simple infusoria, rotifera, and vibriones, for instance. A common garden snail becomes torpid if put in a dry place, and may be revived at any time by the application of a little water. Moisture has revived some animalcules after a torpidity of twenty-seven years. The same is true of some of the most simple vegetables, as mosses. The microscopic wheel animal, after remaining three or four years as a shrivelled point, capable of being broken to pieces like a crystal of salt, is still recoverable by a drop of water, and the vibrio or eel of blighted corn after twenty or thirty years. Yet electricity destroys their capability of resuscitation. Most vegetables become torpid in winter. Many lichens and mosses, dried in herbaria, have been restored to life by moisture after the lapse of very many years. Seeds and bulbs, which have remained for centuries in the bowels of the earth, have sprung into life on being thrown into a more congenial soil:* this was shown recently in trenching for a plantation in part of Bushy Park, which had probably been undisturbed by the spade or plough since, and perhaps long before, the time of Charles the First. The ground was turned up in the winter, and

* Turner.

in the following summer it was covered with a profusion of the tree mignonette, pansies, and the wild raspberry, plants which are nowhere found in a wild state in the neighbourhood; "and in a plantation subsequently made in Richmond Park, a great quantity of the fox-glove came up after some deep trenching. The Hypecoum procumbens was lost in the Upsal gardens for forty years, but was accidentally resuscitated by digging the ground it had formerly occupied; and a species of lobelia, which had been missing for twenty years in the Amsterdam garden, was unexpectedly recovered in the same manner."

Yet, perhaps, it is more extraordinary, that "in boring for water lately at a spot near Kingston-on-Thames, some earth was brought up from a depth of three hundred and sixty feet, which earth was immediately covered over with a hand-glass, to prevent the possibility of any seeds being accidentally deposited in it, yet in a short time plants vegetated from it." Bulbs found in the hand of a mummy taken from the pyramids, after having been immured between two and three thousand years, produced unknown plants when sown in one of our botanical gardens. A quantity of wheat found under similar circumstances was equally productive. Mr. Jesse mentions a case which occurred some time since at Newcastle-on-Tyne: some earth, which was dug up to prepare for the foundation of a house, was thrown on a piece of ground in the front, intended for a garden. The following spring a number of caper plants came up; they were not common in that part of the country, and their appearance therefore created a great deal of surprise. Upon inquiry it was found that some years before this ground had been a public garden; it therefore appeared certain that these seeds had remained dormant whilst buried deep in the earth, and had sprung to life as soon as they were brought within the influence of heat and light. Thus a satisfactory conclusion may be drawn that seeds do not lose their vitality through a long period of time.

"Vegetable life resembles nothing known in nature but animal life, and with this it has a striking analogy. Many of their functional operations are alike; and these in both require the presence and co-operation of their living principle, and cease in both when that is withdrawn. Its presence and activity first appear in the germination of the seed or bud, as they do in the animal egg under the warmth of incubation. In plants, germination seems to have a specific and regular term in each particular species. But though cold represses it, yet this repression only causes it in the regions of frost and snow, to spring up, as soon as the brief season of heat occurs, with a rapidity which the temperate climates do not experience. It can lie dormant in some species without expiring, when it seemed to have forsaken them. This living principle has the singular property, as we have seen, of remaining dormant and inert for years or ages in plants, without therefore ceasing to exist," and the same extraordinary tenacity of the vital principle has been discovered to exist in some few of the lower orders of animals, particularly in toads. But though gifted with such tenacity of life, yet that life is often but a few degrees raised above death. Many of them select for their retreats damp and gloomy caverns, and vaults shut out from the access of light and air. One was put into a flower-pot and buried in the ground, and at the end of twenty years it was taken up and found to be increased in size and apparently healthy. But so many instances have been recorded of toads having been found incarcerated alive in blocks of stone and marble, or in trunks of trees, that it is no longer doubted whether they may not have been accidentally interred alive, as it were in a torpid state, and have continued so, till their grave being opened, and the air admitted to their lungs again, their vital functions have been resumed. Mr. Bingley names some cases where the toad was found imbedded within the wood of an elm or oak tree, and several, where it was cut out of stone or marble. It is difficult to say which is the most extraordinary circumstance. That they should retain vitality in such an enclosure, or that they should have remained still or torpid long enough to have allowed the wood or stony matter to have formed around them.

This poor animal leads a solitary life at all times, seldom venturing abroad except in moist evenings, when it finds sufficient supply of food in the snails and worms with which the grass and pathways then abound. It is its extremely forbidding aspect only that has obtained for the toad its present unjust character of being a dangerously poisonous animal. Harmless and inoffensive, possessing neither the means of offence nor of defence, it is persecuted and murdered wherever it appears, on the supposition merely, that because it is ugly it must in consequence be venomous. Its eyes are, however, proverbially beautiful, having a brilliant reddish gold-coloured iris surrounding the dark pupil, and forming a striking contrast with the remainder of the body. Hence Shakspeare, in "Romeo and Juliet," remarks,

> "Some say the lark and loathed toad change eyes."

Its reputation as a poisonous animal obtained for it, among the superstitious, many preternatural powers, and the reputed dealers in magic art are stated to have made much use of it in their compounds. This circumstance caused it to be inserted among the ingredients adopted by the witches in Macbeth to raise the spirits of the dead:

"Toad, that under the cold stone
Days and nights has thirty-one;
Swelter'd venom, sleeping got,
Boil thou first in th' charm'd pot."

Milton also uses the expression "squat like a toad," in describing the fallen spirit as sitting at the ear of Eve, and tempting her in a dream.

It is no difficult task, singular as it may appear to those who have never attended to this animal, to render it so tame that it may be taken up in the hand and carried about a room to catch the flies which alight on the wall. Toads, frogs, and the rest of the animals of their order, become torpid towards the conclusion of autumn, and remain so during all the winter months. The place of retreat with some is either in the cleft of some rock, or under the hollow root of a tree, and with others amongst the mud at the bottom of stagnant pools. All other cold-blooded animals, natives of this country, secrete themselves, and become equally torpid during the winter. The snail carefully closes up its shell at the commencement of winter, with a thick white cover or operculum, attached to its body, which just fills up the opening, and in this enclosed state, glued in some sheltered spot, it remains till the return of warm weather, seldom appearing abroad till about the beginning of April.

The American black bear is the largest of hybernating animals. In general this species hybernates in the northern parts of the fur countries; and Dr. Richardson states, that in certain years, and in very severe winters, great numbers enter the United States from the northward. These are all lean. The natives assert that a bear which is not fat cannot hybernate; therefore those that have not acquired sufficient fat when winter overtakes them necessarily emigrate to a milder climate. When these animals retire into their places of concealment they are always fat and in high condition; and when they make their first appearance in the spring, they are, on the contrary, excessively lean and emaciated, from the absorption which has taken place. In consequence of this a general, though a very absurd, notion prevails, that they are enabled to live through the winter by sucking their paws. The poet Thomson thus describes the retreat of the bear in the frozen regions of the North:—

> "There through the piny forest, half absorpt,
> Rough tenant of those shades, the shapeless bear,
> With dangling ice all horrid, stalks forlorn;
> Slow paced and sourer as the storms increase,
> He makes his bed beneath th' inclement drift,
> And with stern patience, scorning weak complaint,
> Hardens his heart against assailing want."

The badger, in this country, during the severity of winter remains in a torpid state in his den, sleeping on a commodious bed formed of dry grass. The hedgehog also wraps itself up in a warm nest of moss, dried grass, and leaves, and sleeps out the rigour of the season. It is frequently found so completely encircled with herbage, that it resembles a ball of dried leaves; but when taken out and placed before a fire it soon recovers from its torpidity. The bat is occasionally resuscitated by some sudden increase in the temperature; otherwise its rest is unbroken. I saw one on the wing on the 15th November, 1838.

To descend to a lower order of animals, there is one subject which, while it claims our attention, calls forth our unqualified admiration; namely, the hybernation of insect eggs.

The assertion of Paley that "the human animal is the only one which can clothe itself," though it accords with what is known of quadrupeds, birds, and fishes, by no means holds good in the insect world. Men, indeed, proceed by means of reasoning and experiment to the discovery of such materials as are best fitted for protecting their bodies against the vicissitudes of temperature and other changes of weather; while insects are taught by Providence to select instinctively the best material for their clothing. This is exemplified in a very remarkable manner in the coverings made by different families for the protection of their eggs.

The maternal affection of the eider duck has frequently been celebrated by naturalists, from her stripping the down from her own breast to line her nest, a circumstance which is also exemplified in the common rabbit: but both of them are outrivalled by more than one moth; for the latter, not contented with a nest made of their own down, take pains to cover with it each individual egg. The female, for instance, of the gipsy moth (*Hypogymna dispar*) has the hinder parts of her body thickly clothed with a soft down of a brown colour, which is wanting in the male, evidently because to him it would be of no use. As a covering to her own body it can be but of small service, since she emerges from her pupa case or chrysalis during the hot days of August, and does not usually live more than a week or a fortnight. Its chief or sole purpose, therefore, is to furnish a covering for her eggs. Each egg, being covered with adhesive gluten, attaches around it all the hairs of the down with which it comes in contact and also sticks to the bark of a tree. These eggs, which are deposited with so much care, are destined to abide all the pitiless pelting of the storms of winter; for although they are laid in August, they are not hatched till the elm comes into leaf in the following spring. The covering of down, accordingly, from the manner in which it is tiled and brushed smooth by the mother moth, not only protects them from wet, but from severe cold, it being one of the best non-conductors of heat. The experiments of modern chemical philosophers have proved, beyond a doubt, that the warmest material for clothing is not what imparts most heat to the body, but what best prevents the escape of the heat generated there. A valuable treatise on this subject, termed "Thermal Comforts," has been written by Sir George Lefevre, M.D., who paid great attention to it during his lengthened and professional residence in Russia. The feeling of cold does not arise from anything positively cold, but solely from a deficiency of heat. On putting the hand, for example, on a piece of ice, the feeling of cold does not arise from cold given out by the ice to the hand, but from the heat which the ice takes from the hand, which heat can be actually traced in the water formed by the melting of the ice: but when the hand is laid upon wool, feathers, or down, these do not feel cold, because they do not carry off the heat of the skin so rapidly as the ice.

It may appear a little paradoxical, though the doctrine is sound, to assert that down and similar materials are nearly as well calculated for protecting an animal from excessive outward heat as from severe cold. This, however, has been long known as a fact to the Neapolitan peasantry, who convey snow from Mount Vesuvius to Naples in the summer for the purposes of luxury: they preserve it from melting by covering it with chaff and wool. The carts of the ice-merchants which perambulate London are covered with blankets. It may not be out of place to remark, that instances occur among insects precisely similar to what has been detailed respecting the gipsy moth. The brown tail and the golden tail moth (*Porthesia auriflua* and *Porthesia chrysorrhea*), whose caterpillars spin themselves a warm nest before the setting in of the winter colds, seem no less careful to protect their eggs from the summer heats of July and August, at which times they are deposited. If we reflect, that at the return of spring the whole creation swarms with insect life, and that each one of the myriads which surround us has passed through every vicissitude of weather which characterize our winters, protected and in safety, how great must be our admiration, and how deep our acknowledgment, of the stupendous power of Providence!

The metamorphoses of insects are their most characterizing peculiarity. In these we certainly behold three distinct animals, as dissimilar from each other, in some genera, as the bird is from the serpent and shell-fish, and yet united into one and the same living being by the personal identity of their principle of life. This only continues permanent and abiding through their triple change of material form. The bodily substance undergoes the most striking mutations, but the existing and feeling self remains unceasing and unaltered through all. The same animal crawls in its caterpillar state, rests or sleeps in its torpid chrysalis, and springs from earth into air with its new wings, its proboscis, and antennæ, in its butterfly or moth configuration. What a stupenduous wonder this magical transformation would be to us, if it were not so familiar! There is no reason to doubt that all the parts of the butterfly are in the caterpillar, as those of the human being are in the oval embryo. The material mechanism, the specific organization, is all ready and arranged, though not at first discernible from its invisible minuteness. Gradually this hidden form increases into an object of sight; every limb and function enlarging in just and progressive proportion; until the complete figure, so exactly beforehand conceived, assigned, and provided, grows into its last perfection, and emerges, like a new creation, into its aërial and beautiful vivacity.

It seems like a resurrection from the tomb into a fresh life, with celestial destinations. It is so analogous to that which the human spirit is appointed to undergo, that the intellect cannot well avoid viewing the insect transformation as the emblem, the token, the natural herald, and promise of our own. The ancients of the heathen world thought so, for one of their most pleasing imaginations, yet visible on some of their monumental slabs which are dug up, is that of a butterfly over the name or the inscription which they record. They place the insect there as the representation of the Psyche of the animating and surviving soul; as the intimation that it will reappear in a new form and region of being. It is thus analogous to the word "*Resurgam*" on our hatchments. The allusion and applicability are most striking. Like the insect, which, in the case of all the *Sphingidæ* and some others, hybernates as a chrysalis, and effects its transformation in the earth, the human personality has three changes, and states, and forms of being. It emerges from its ovum into the figure and life of the present fleshly body, it rests in its earthly grave, unextinguished, though visible to mortal eye no longer; and it will emerge from that at the appointed time into its ethereal nature and immortalized capacities, always the same self in each transformation; never dying nor dissolving with its material investment; but surviving to bloom in everlasting youth, amid the most exquisite felicity, with angel wing perhaps, and an imperishable vitality.

# THE PASSIONS OF ANIMALS.

THIS is an all-fruitful and attractive theme, whether we regard it as conducing to our own ends, by enabling us to subdue all creatures to our will, or whether we look with feelings of admiration on the display of the higher qualities in some animals, as splendid in their expression, beautiful in the attitudes in which they are conveyed, and as speaking in a language of mute eloquence; or whether we amuse ourselves by the cunning, or vex ourselves by the sullenness and obstinacy of others.

The study of human nature and the knowledge of character have occupied many, and are the fancied and prideful boast of nearly all, but yet how far are we from having reached any true result, and how speculative is the subject! Perhaps Talleyrand, who was doubtless one of the keenest interpreters of the human mind, proved the impracticability of the science, when he remarked that the use of speech was for the concealment of the ideas. From the plausibility of the courtier and the finesse of the politician, to the common passages of life and the conventionalities of society, the truth of this remark is startling and incontrovertible. In the character of animals, varying as it is in all species, and even in the different individuals of each species, we have one difficulty less to encounter, inasmuch as at least duplicity, innate with mankind, according to Talleyrand, cannot exist. Artfulness and cunning, planned and deliberate, are substituted for it, but they are emblems of character, and have no connection with, nor operation on, other beings in a moral light. There is hardly a vice incident to humanity, which is not to be discovered in, if it be not the peculiar characteristic of, some animals. Humiliating as is the fact, it is but too undeniable. The phrenologist admits it by allotting certain divisions of the brain to the "animal passions," in his fanciful and dangerous science; while the moralist draws a veil over the deformity, or subjects it to no degrading comparison. These vices, which brutalize mankind, are characteristics only in animals to some extent as regards their habits; while their passions, either good or bad, are called forth only by circumstances and the effects of treatment. In the higher qualities of generosity, endurance, submission, and attachment, man loses infinitely in the comparison, as the lurking feeling of self may generally be traced to the root of his actions. The high courage of the horse, the attachment of the dog, the enduring patience of the camel, and the submission of the elephant, though arising from the effects of discipline in some instances, are at least habitual to them, and altogether disinterested. Abused, neglected, overtasked; they are passive under suffering, and struggling, even in their agonies, to accomplish the will of him they serve, they perish in the task. To evil passions they are strangers, while those others which belong to them are the emblems of character, or are called forth by the exciting action of the moment. They are highly remarkable, but so transient, in their expression, and so difficult to represent from their startling vigour and beauty, that the magic pencil of a Landseer even hesitates at the attempt; and yet if we examine narrowly the causes of this power, we find that the eye is the speaking organ, although attitude completes the effect. Our admiration at the extraordinary variations and powers of which this member is susceptible is increased, when we reflect that the combined features of the human face, changing in their expression with every emotion and feeling, lightening up or clouding over, and assuming different aspects of character, like the changing hues of the landscape, can do no more. What sameness would pervade the face of animated nature without this speaking appeal to our senses, and how great would be the abstraction from our enjoyment; for it is not the least pleasing part of our observations to notice the modes by which animals communicate with one another, and the actions by which they are accompanied. The human mind has been susceptible of this power in the lower animals, and conscious of this great manifestation of the care and providence of the Creator, from the earliest times. The Scriptures abound in comparisons and metaphors of the most forcible character, which, in sublimity of expression and sentiment, cannot be surpassed, and indeed could only have been written by an inspired hand, portraying as they do the perfect knowledge of the characters and habits of the animals mentioned. What language can excel the description of the horse as we find it in Job? "Hast thou given the horse strength? hast thou clothed his neck with thunder? Canst thou make him afraid as a grasshopper? The glory of his nostrils is terrible. He paweth in the valley and rejoiceth in his strength; he goeth on to meet the armed man. He mocketh at fear, and is not affrighted; neither turneth he back from the sword. The quiver rattleth against him, the glittering spear and the shield. He swalloweth the ground with fierceness and rage, neither believeth he that it is the sound of the trumpet. He saith among the trumpets, ha! ha! and he smelleth the battle afar off, the thunder of the captains, and the shouting." The human mind cannot conceive more powerful imagery, nor can language be found to describe in more perfect terms the indomitable courage and nobleness of the horse.

But we must not permit ourselves to imagine that the Omnipotence regarded only the comforts and advantages of man, and that, in placing all things under him, he had no care for the inferior order of the creation. The extraordinary powers of instinct with which they are endowed would at once convince the most sceptical, even were they to forget for a moment, that in God's denunciation against our first parents he decreed in the same edict the condition and fate of all creatures, and implanted in them the same fear towards man which man was to have towards him. But we may even carry the point farther, and although our ideas become speculative and lost in an unfathomable depth, yet we can only draw the undeniable conclusion that each created being was formed for a specific purpose, and to assist in carrying out the vast machinery of the globe. The miraculous collection and preservation of the various species of animals in the ark, a vast proportion of which are not only useless to man in a direct sense, but even dangerous to him, is highly conclusive of the important place they hold in the creation, as conducing towards the admirable harmony which prevails. Although many of these animals, such as the beasts of prey, are, as stated above, unprofitable to man in a direct sense, yet they are perhaps of the most essential service by keeping within due limits the wild animals of the plain, whose numbers and encroachments would consume and destroy the produce of the earth. Probably for the same or similar reasons certain races of animals were sentenced to be extirpated at the deluge, and we only know that they once existed by the stupendous remains of them which have been found in a fossil state: fruit, fish, and crustacea similar to those which exist in the present day are also found; but why were these preserved and those destroyed? Scripture tells us that "of clean beasts, and of beasts that are not clean, and of fowls, and of everything that creepeth upon the earth, there went in two and two unto Noah in the ark, the male and female, as God had commanded Noah;" and yet an exception was made, as the remains of these extinct races testify. To explain this contradiction, and to account for other similar phenomena, geologists have ascribed their existence to an earlier date, and their destruction to a former wreck of the world; and this might appear plausible were the evidence adduced left undisturbed by a most startling fact. Up to a certain period fossil bones had alone been discovered; and the tusks of the mammoth scattered over the north of Europe, and abounding on the shores of the polar seas, proclaimed the former existence of a behemoth;

but time brought to light from the centre of an iceberg the whole and undecayed carcass of the mammoth itself, and subsequently, in Russia also, a rhinoceros of the present race has also been discovered in a like way. If, then, the theory of geologists holds good, both the mammoth and rhinoceros in question, the extinct as well as the existing race, which doubtless, from the similarity of the circumstances, must have been entangled in the same destruction, must have lived prior to the deluge and the scriptural creation, undergoing no decay, and alone remaining in the flesh throughout a wreck which engulfed and annihilated every living thing on the face of the earth, besides having passed through the former chaos of geologists. There is one only instance known of the entire extinction of any of the animals which have existed since the deluge, which is the dodo, a bird known to have inhabited the island of Madagascar, and of which the only remaining record is a foot in the Ashmolean Museum, at Oxford. According to the Mosaic account, the various races of animals were preserved miraculously in the ark "to keep seed alive upon the face of all the earth;" and this subject is so inexplicable that it admits of no speculations or theories like those of the geologist with regard to antediluvian remains. The different animals are spread over the earth in climates and positions adapted to their wants and habits, and however they may vary in some respects in different countries, yet the type of each race is easily traced, and the distinctions which exist may readily, and without violence to our ideas, be ascribed to climate, soil, and other natural causes. This is as regards the old world; but if we look at the productions of America and Australia the resemblance ceases, and with new forms we step as it were into a new creation, with our cherished theories beat down and our ignorance established. We are assured beyond a doubt that it has pleased the Creator to exterminate certain races of animals, and while his protecting hand maintains the existence and steady succession of those, which are and have been familiar to us, it is not presuming too far, nor hazarding too bold an idea, to imagine that he may have been pleased to have extended his gifts and to have peopled those regions subsequently to the general destruction of the world at the deluge. The fact of these animals being so dissimilar from those of the old world gives at least some plausibility to the idea, which is far from being diminished when we examine their extraordinary aptitude to the localities in which they are found. In Australia, for instance, we are informed by those who have penetrated into the interior, that the country is covered with patches of tall and almost impenetrable grass, and that the kangaroo abounds in such districts, and in no others. The bodily formation of this animal would have been an inconvenience to it in any other circumstances; but to suit the peculiar nature of the face of the country, we find an animal so peculiarly adapted to live on and move over its surface, that we cannot for a moment imagine that it was created for any other position than that in which we find it, or that it wandered about with the instinctive object of finding a spot suited to its habits. There is nothing startling in this opinion, nor does it either stagger our belief or shock our ideas of rectitude or of proper feeling. It is true that we no longer behold the direct and manifest agency of the Almighty, and that the utmost point to which we are allowed to reach, is the observation of his care and manifold mercies through secondary means. But to carry this subject one step farther, it may be said that in placing implicit belief in the creation, as described in the first book of Moses, we are bound to consider that the "dry land" comprised the world as it now is, whereas we know that vast islands in the Pacific have sprung into being through the wonderful agency of the coral insects, whose minute labours are still continually adding to them, and even building up new ones.

Looking thus at the creation as full of benevolence and of gifts distributed with an open hand, we cannot but feel that the subordinate animals have participated in the general gladness, and that even the protection of them and the avoidance of cruelty towards them were enjoined to man. If it be argued that these injunctions were meant to operate on men's minds by exciting a kindly influence towards each other, still they operated most directly in establishing kindness of treatment towards the brute creation. What but mercy of the highest character is to be found in the following ordinances :—"and whether it be cow or ewe, ye shall not kill it and her young both on one day."—"Thou shalt not seethe a kid in his mother's milk." "Thou shalt not muzzle the ox when he treadeth out the corn," and "if a bird's nest chance to be before thee in the way in any tree, or on the ground, whether they be young ones, or eggs, and the dam sitting upon the young, or upon the eggs, thou shalt not take the dam with the young: but thou shalt in any wise let the dam go, and take the young to thee; that it may be well with thee, and that thou mayest prolong thy days." The same overflowing mercy has shed its influence over the whole animal world, and has endowed it with feelings, enjoyments, and susceptibilities, which give a charm to their existence, while it at the same time harmonizes with the pure spirit of benevolence which stamps the universe. But man, the lord of all, abusing these gracious gifts and perverting their object, avails himself of these qualities and passions implanted in animals, to turn them into sources of brutal gratification, and scenes of violence and blood. The exhibition of the excited and deadly passions of animals has for centuries back been a favourite amusement, and in the earlier days was considered to belong exclusively to royalty and the wealthy of the land. There is something grand and awful in witnessing indomitable courage, the pride and consciousness of strength and the fearful display of rage and violence, but to prostitute them for mere sensual enjoyment is debasing and at variance with the divine command. So beautifully are God's gifts balanced, and so perfectly is the good made to operate upon the evil, that in all animals in which the fear of man is the cause of their greatest suffering, there is a compensating principle of happiness implanted in them, in their passions, excitements, enjoyments, and instincts. The horse, released from his stall and turned free into the field, bounds in an ecstacy of enjoyment over its surface, as with flowing mane and expanded nostrils, he gallops forth exulting in his freedom; then wheeling round with his body inclined to the circle he is forming, he stops suddenly at some imaginary sound or appearance, listens with erected ears and motionless form, and again dashes forth in the luxury of joy and life; presently his speed is slackened, and snorting and pawing the ground, he trots towards his admiring master in all the beauty of attitude and pace, to renew again his course of freedom and delight. We follow with our looks, an inward smile gladdens our hearts, and our pulse quickens with emotions of pleasure. But, as if even the very passions and nobleness of the horse were to be subservient to man, he cannot assume his authority without participating in them. Mounted on its back, each bound, each throb imparts a corresponding sensation to the pulse and nerves of its rider: an identity of feeling seems to pervade them, the man glorying in the matchless vigour and powers of his horse, and the horse lending itself to the daring courage and impatient speed of its master.

In the chace, he seems to enter into the spirit of the sport; trembling almost with anxiety, he stands with pointed ears and breath almost subdued at the cover's side awaiting the glad signal; a hound gives tongue, and he thrills with joy, and when the well-known shout and the short blast of the horn are heard, he becomes impatient of restraint and demands to join in the burst. Neither space nor obstacle intimidate him, he devours the one and surmounts the other; but, as if to prove the intimate and mysterious spirit which influences both horse and man, the former flags under the loins of a timid rider, and swerves at the leap which he feels the latter has not nerve to encounter, and which he would have cleared unbidden under bolder hands. This keen relish of the sport is more than the effect of circumstance and place, and seems to be almost innate; at all events if once enjoyed, it is never forgotten. Some horses confined to their stables have refused food for a day or two after having been excited by the accidental cry of hounds within their hearing, and others attached to carriages have dashed off and attempted to join the inspiring scene. The thrown rider will often see his horse continuing his straight and unchecked career, and other horses have leaped the enclosures of their fields and have pursued the chase wild and free.

In the race, trained to the very perfection of strength and vigour, with every muscle developed and every nerve knit to their highest degree of tension, he stands forth the model of beauty and symmetry. Conscious of the trial which awaits him, he is impatient of control, and, in the elasticity of his movements and graceful curvettings of his body, testifies the intensity of his enjoyment. Emulous of speed, he submits with difficulty to the cautious tactics and judgment of his rider, and when within a few strides of the winning-post, he responds to the tightened muscles and powerful assistance of the jockey, by redoubled efforts to pass his competitors. It is a well known fact that these noble animals are attended in their stables principally by boys, who never leave them, and to whom they become most extraordinarily attached. In their high condition they will hardly bear the approach of a stranger or indifferent person, without striking out or attempting some violence, but to these boys they are perfectly gentle and obedient. But perhaps in no part of the world are the passions of the horse better understood than in the East. The constant companion of the Arab, whether in rest or toil, and sharing the same tent with him, he identifies himself with his master, and serves him with a fidelity and gentleness as remarkable as his courage and fearlessness. It is recorded that, at the battle of the Pyramids, the Janissaries, mounted on the finest Arabian horses in the world, actually backed them on to the French bayonets, in their attempt to break through the squares of the troops.

A remarkable instance of the matchless courage and high training of their horses, and of the furious zeal and desperation of the men—for, quailing beneath that sustained and rolling fire which gained for Bonaparte the name of "Sultan Kebir" in Egypt, they attempted to break through the serried ranks of their opponents by sheer strength alone. It may be also said to illustrate the fact, that the ardour of the horse stimulates in an extraordinary manner that of the soldier.

Domestication has not only given strength to the innate passions of animals in general, but has also created or developed new ones, while it has subdued others. Instinctive fear is modified into mere shyness, and dread is converted into affection. The latter feeling, as connected with dogs, has been the favourite theme of almost every poet from the days of Homer. The affection and death of the dog of Ulysses form a beautiful episode in the immortal poem of the Odyssey, and there is hardly a tale or poem of Scott's in which the dog does not appear as a principal character. History records their feats, among which the infamous practice of the Spanish settlers in Cuba of hunting down the native Indians with blood hounds, will ever be remembered as a monument of the most disgraceful cruelty. Possessed of the highest attributes, without a vice to tarnish them, the dog stands pre-eminent; a guide to the blind; the protector of his master and his property; his companion in good and evil, and the promoter of his sports, he seeks no other reward but that of approbation. Passive under punishment, he licks the hand which inflicts the blow, and seeks to appease the violence and anger of his master by redoubled efforts to effect his will. There is certainly no animal which possesses to an equal extent the power of expressing its joy and pleasure. It not only loves to be caressed, but claims it as its reward—speech can hardly be more eloquent than its actions under the impulse of affection. It seems to understand the wayward changes of the human mind, entering sportively and joyously into the happiness of its master, and watching attentively his eye, it conforms itself to his quiet and thoughtful moments.

By skill and training, man has adapted the race of dogs to every want and gratification. The greyhounds in the leash, ready to be loosed for the match at the given signal; can anything be more noble than their attitude, or more expressive than their gestures! Ardour and emulation are visibly depicted in their excited and anxious looks. When slipped they seem to fly; the hare turns, and they check their amazing velocity almost simultaneously; they near their victim, and one, with a powerful effort, throws itself at its prey, seizes it, and rolls headlong over with it from the impetus it had acquired.

The love of sport is undoubtedly the leading characteristic of dogs, from the wretched cur of the idle vagabond in the street to the noble and majestic hound. The former skulks along the hedgerows with his master, hunting rats and other small vermin; while the latter, seemingly conscious of its superiority, disdains all but its legitimate prey. How joyously they come forth from the kennel, and how readily they collect together to follow the steady pace of the huntsman to the meet. They reach the cover, and with wild ardour bury themselves within it — the death-like silence is soon broken by a deep-toned cry—the challenge is heard and is quickly responded to by the whole chorus of tongues—it concentrates, the fox breaks the cover, which is too hot for him, and away they dash, scrambling into the open ground through every possible aperture. Compact and true, and filling the air with their exciting melody, they stream over the land with untiring purpose and resolution—the scent is breast high, and they almost view him—every tongue is hushed, and, with heads erect and straining nerves, they feel the maddening interest of the moment.

The fear that dogs have of a lame man is highly singular, that is, of a man who, having one leg shorter than the other, stoops at each alternate step. The action is so much like that of a person stooping to pick up a stone, that it may be thus accounted for. Courage is, however, inherent in dogs, which they seldom degrade or apply to bad purposes, except when trained and instigated by their masters. The dog-pit and the bull-ring are unhappy instances of the misapplication of the noble spirit of the animal, and the effect of these pernicious schools is to render them quarrelsome and dangerous.

But there is probably something more than the mere canine fancy in bull-baits, which, like the bull-fights in Spain, seem to have for its object the display of the blended passion and goaded fury of the bull. They will only bear comparison as regards that one feature, for the one is distinguished by the most disgusting brutality and violence of a ferocious mob, while the other has at least dignity of scene and practised art to palliate it. Got up with all the pomp of scenic effect and graced by the presence of the first people in the land, the bull-fight in Spain maintains its character as a national sport, while other nations, through the process of civilization, have not only discontinued all barbarous sports, but have passed laws for their prohibition. Menageries have hardly yet ceased to be a kind of appendage to royalty, and it is highly probable that the habit descended through long ages for the purpose of providing sport in combats between the animals. We read that Queen Elizabeth had a bear ward, and Spain has to the present day her Matadors, and in tracing customs to their origin, we find the first mention of ferocious animals kept in confinement in the book of Daniel. There are many reasons for believing that the lions of Nebuchadnezzar were kept for the purposes of royal amusement in the arena. The fact of Daniel being cast into *the den*, infers that it was a known place, and peculiarly under the protection of the king, from his counsellors suggesting it as the place of punishment for those who should infringe the royal decree, and as there were many lions, it may reasonably be concluded that they were not kept as mere objects of curiosity in a country where they existed in a wild state: and besides, we find that the customs of the East have remained, even after the lapse of centuries, unchanged to the present day; a fact incontrovertibly proved, even in the most minute points, by Sir Gore Ousely, who seems to have travelled through Persia with his Bible in his hand:—and combats between animals form still one of the state exhibitions of the native princes of the East. It was a natural result of the extended conquests of the Romans, that they should contract a taste for the games and exhibitions of the countries they subdued, and that they should bring home with them the wild animals of those remote regions, not only for those purposes, but also to grace and to give greater lustre to their ovations, flattering thus the vanity of the people by the display of the wonders of the distant countries which had succumbed to the victorious arms of the republic.

It is not within the limits of this paper to dilate on the policy of these exhibitions, which, while pandering to the weaknesses of the people, blinded their judgments, and annihilated their ancient courage and freedom, and laid the foundation of that degradation and despotism which eventually led to the fall of the Empire. A close and singular parallel is to be found in the annals of France, which attempted to palliate and to justify the horrors of her revolution under the cloak of the sentiments and virtues of ancient Rome, and eventually created for herself that ruler whose master spirit governed her with the sceptre of a despot, by dazzling her judgment and entrancing her feelings by the successive exhibitions of triumphs and of spoils, and by the erection of monuments which recalled the noblest days of Rome, without the iron virtue of her people; and perhaps the parallel may be carried one step further to complete the picture of human character, when degraded by brutal despotism, whether of one tyrant or of the many-headed monster—the people. The French people, true to this law, refined on the ferocious joy of the Romans at the dying agonies of their victims, by glutting themselves with unheard of tortures and human butchery of the most fearful kind.

Emulous of each other, each conqueror attempted to outvie the splendour of his rival or predecessor, and what had once been a standard of pride to the citizens became at last necessary to their habits, and indispensable for the preservation of the popularity of the ruler. Abstracted thus from all interference with the government, the people became listless and enervated, and satiated with the sight of the blood of the victims of their games, and callous to their sufferings, their blunted feelings required fresh stimulants, till at last butchery and cruelty alone were left to fill up the measure. Gibbon, in describing the triumph of Aurelian after the conquest of Palmyra, A. D. 274, states, that it was ushered in by twenty elephants, four royal tigers, and above two hundred of the most curious animals from every climate of the then known world, and that the car of the Emperor was drawn either by four stags or by four elephants, while one thousand six hundred gladiators, devoted to the cruel amusement of the amphitheatre, followed in the train.

At a former period the stern economy of the republic stepped forth and destroyed these vehicles of popular adulation, for, as history tells us, Regulus, the Roman Consul, was defeated in the first Punic war by the elephants employed in the army under Xantippus, and that the Roman soldiers dreaded the encounter of these formidable beasts, but eventually Metellus obtained a complete victory over the Carthagenian army, capturing one hundred elephants, which he immediately sent to Rome, and after the people had been sufficiently gratified by the exhibition of these rare animals, the state caused them to be destroyed, as their services in no way compensated for their maintenance. It appears that they were treated with great cruelty, being driven round the circus by slaves armed with blunted spears. It has been attempted to palliate this act by representing it not as one devised to gratify the passions of the people, but to remove the impressions of terror which had been prevalent by the former defeat of Regulus. Considering the high character of the Roman people of that day, there may be some grounds for this explanation; but it is a solitary case. Milton, in his fourth book of "Paradise Regained," thus alludes to the Romans under Tiberius:—

"First ambitious grown
Of triumph, that insulting vanity;
Then cruel, by their sports to blood inured
Of fighting beasts, and men to beasts exposed;
Luxurious from their wealth, and greedier still,
And from the daily scenes effeminate."

True to this text, the wants of the people expanded, and the narrow limits of the circus became too confined to satisfy the craving appetite for blood and suffering, and under the reign of Vespasian the foundations of the stupendous colosseum were laid, which, as if to gratify the imperious feeling of the public, was completed in the short space of three years, when Titus celebrated its dedication by the slaughter of five thousand beasts of all kinds in the presence of eighty thousand spectators. The renown of Sylla was unable to procure for him the suffrages of the people without some extraneous aids, and he availed himself of the rooted love for brutal sports among the Romans to accomplish his purpose, by turning a hundred lions and as many men into the arena at one time. But Pompey even exceeded this spectacle, for it is recorded of him that he exhibited a combat of five hundred lions and eighteen elephants, besides armed men. On one of these occasions the sufferings of the beasts appeared so great that even the hardened feelings of the people were subdued, and they demanded in the most violent terms of the Consul that the combat should cease. This instance of clemency seems to be a grand exception, and is somewhat singular, as, in the human combats between gladiators, the people had the power of sparing the life of the vanquished party, and but too often, when the exhausted wretch tottered towards them supplicating his life at their hands, they remorselessly turned down their thumbs, as the signal for the final act in the tragedy. Lost to all the better feelings of human nature, the people, satisfied with no less excitement, and reckless at what cost or sacrifice they obtained the gratification of their passions, exacted the performance of these fearful spectacles as the price of their obedience and subjection. Courting popular applause, and happy only under its influence, the gladiator, like the matador in Spain of the present day, volunteered the danger of the circus, and exposed himself freely to the fearful chances of the arena. Refining on their cruelty, and turning from the blunted combat of animals, the people insisted on having a human combatant on the stage to oppose himself to their fury, and criminals were compelled to peril their lives on the issue, receiving a pardon if triumphant; but, as if this supply were not sufficient to meet the savage demand for sensual gratification, the persecuted Christians were driven, by the intolerant power of the state, to pay the penalty of their apostacy from the heathen worship by the most perilous encounters. It is impossible for the human mind to conceive the effect of five hundred lions, four hundred bears, a thousand ostriches, a thousand boars, and other animals in the same enormous quantities, turned out in their respective masses, and to be driven to mutual destruction—a display of the passions of animals on so gigantic a scale that the mind cannot grasp its reality, and can only entertain an idea of the most horrible confusion and maddened rage. There is no instance on record of a nation, or even of an individual, escaping from the most degraded state of demoralization, which had sought cruelty for its pastime, and suffering and the effusion of blood as its recreation. The career of the cock and dog fighter is a sad example of this fact; indifference to animal suffering begets brutality towards his own species, and the prize ring, with open defiance of the laws of God and man, crown his infamy.

The satiated appetites of the ancient Romans required a perpetual change and fresh novelties, and animal life became at last so scarce, that it is recorded of Cicero, who, as pro-consul for Cilicia, was desired by Cælius to procure a number of panthers for the games, that he was unable to comply with the demand, from the almost extinction of the animal in that district. Alligators and snakes were at last introduced on the scene, as if nothing which had life, however noxious and deadly in its character, could escape from the fearful ordeal of the circus. In the present day ingenuity, too, is exercised to find fresh food for the blunted appetites of the frequenters of the ring; and men have even been found who have volunteered to kill a given quantity of rats with their teeth, having their hands bound behind them. Nearly every nation has its brutal tendencies, and possesses a love for witnessing the display of the passions of animals; the Chinese fight quails together, and the Arab brings two male camels to the contest, but the latter, from possessing perhaps more humanity, or careful of the life of the animals on which his own depends, muzzles them, and thus strips the combat of its worst character. Eye-witnesses describe this scene as something ludicrous, for although the rage of the animals is excessive, both from natural causes, and from their being wrought up to a pitch of madness by artificial means, yet their animosity is confined to struggles of strength-like wrestling, and to the intertwisting of their long necks. There is a natural tendency to fight among some animals when their passions are excited, and when pressed by hunger. Travellers who have arrived by the diligence at the Messageries Royales, in Paris, may have noticed that the white horses, which are kept expressly for those conveyances, on being released from the carriage, immediately fly at each other and fight in a perfect melée. A bull becomes highly excited at the appearance of anything red, and pursues the wearer with a deadly purpose. The bull-fighters in Spain avail themselves of this knowledge. The bull fights in that country may be considered as a remnant of the Roman customs, for, as a province of the empire, it adopted with its yoke its habits and institutions; and, as if the ancient spirit had been but little impaired by the lapse of ages, the old ceremonial of the triumph was to an extent revived, when, after his return from the discovery of the New World, Columbus made his entrée into Barcelona with the honours of a conqueror, attended by a procession, of which the strange natives and animals of those unknown regions formed a conspicuous part. Both Robertson, in his history of America, and Washington Irving, in his life of Columbus, state distinctly this fact, and the latter thus describes the scene:—"His entrance into this noble city (Barcelona) has been compared to one of those triumphs which the Romans were accustomed to decree to conquerors. First, were paraded the Indians painted according to their savage fashion, and decorated with their national ornaments of gold. After these were borne various kinds of live parrots, with stuffed birds and animals of unknown species, and rare plants, supposed to be of precious qualities; while great care was taken to make a conspicuous display of Indian coronets, bracelets, and other decorations of gold, which might give an idea of the newly discovered regions. After this, followed Columbus on horseback, surrounded by a brilliant cavalcade of Spanish chivalry. The streets were almost impassable from the countless multitude; the windows and balconies were crowded with the fair; the very roofs were covered with spectators. It seemed as if the public eye could not be sated with gazing on these trophies of an unknown world, or the remarkable man by whom it had been discovered. There was a sublimity in this event that mingled a solemn feeling with the public joy. It was looked upon as a vast and signal dispensation of Providence, in reward for the piety of the monarchs ; and the majestic and venerable appearance of the discoverer, so different from the youth and buoyancy that are generally expected from roving enterprise, seemed in harmony with the grandeur and dignity of the achievement."

In the bull fights the courage of the animal is at first of a passive character, seeking rather to defend itself from the insults heaped upon it than to become the assailant; and it is only when goaded to madness that its passions are fully roused, and it rushes to the attack, and is really formidable. The Roman gladiator is the precise prototype of the matador, for although the encounters of the latter are less perilous, yet the same character, in a subdued form, distinguishes him. He knows no other pursuit than the exhibitions of the circus, and his life is devoted to the practice of that sport, the success of which secures to him the only object of his ambition, namely, popular applause. The comparison holds good in a wider sense, and the object to be gained in both cases bears a striking similarity. The grandeur of the colosseum could hardly be excelled, but the appeal to the sensual feelings of the Spaniards is as strong as the presence of royalty, princely pomp, and the gay dresses of the matadors can make it, and the excitement of the scene has been found equally as effective in turning the turbulent minds of the people from a more dangerous tendency, as the games in ancient Rome.

The horse, as has been stated, is the only animal whose noble courage and fiery ardour stimulates man, and whose services are pre-eminent in action. In the present day there is no instance known of any other animal being employed in war, excepting by the Namaquas, a warlike tribe in Southern Africa, who have trained a magnificent race of oxen it possesses to charge its enemies in battle. These beasts are described by Le Vaillant as being naturally ferocious; but it is a singular trait in the character of a species which is, even in its wild state, cautious of an encounter, that it can be made available in war. The American buffalo, terrible in its aspect, is dangerous only when driven to extremity by the hunter, and it has an absolute terror of the wolf; the latter, conscious of the superior strength of the buffalo, and of its inability to attack it singly, forms a pack of twenty or more individuals, which, advancing on the herd of buffaloes in a crescent, drives it before them with unabated speed, till the weakest drop, or the herd, in an ecstasy of terror, leap over a precipice, and there perish. No circus can produce such a scene, and it is difficult to conceive the grandeur of it. Bloodthirsty and ravenous for their spoil, the wolves pursue with fiery speed, with every nerve and passion strained to their utmost tension, while the buffaloes, with their whole being absorbed in one feeling, fly with blinded terror, their eyes and nostrils inflamed with its agony, breathless and panting, their tongues protruded, and their shaggy hides embossed with foam. The eye beholds the scene with awe and without horror : nature is the prompter, and the boundless prairie the theatre.

This system of advancing upon their prey, and outflanking it by their crescent-shaped array, seems to be common with wolves, even when the object is but a solitary individual. Dr. Richardson states, that on one of the Arctic expeditions he was sitting on an eminence overlooking the sea, and lost in thought, when, accidentally turning his head, he found a pack of white wolves drawing upon him in that very manner, and that his only escape was through their ranks, which he accomplished, although they hardly withdrew at his approach.

Anger is only a transitory passion with animals, and although it may be of the most uncontrollable nature, it is seldom of a revengeful character. There are several well-known humorous anecdotes of the elephant punishing those who have offended it, which belong to the high class of instinct with which that animal is endowed ; and it has been known to be inconsolable for the loss of its keeper, whom it had destroyed in a paroxysm of rage. The camel is subject to violent outbreaks of fury, which render it highly dangerous; but the native Arab appeases it by throwing his garments before it, which the animal tears and tramples upon with fearful violence, and having thus expended its rage, it allows its master to reassume his authority without the slightest opposition. Of the outbreaks of the predatory beasts in a state of nature but little can obviously be known, and what we have seen would lead us to infer that they are neither general nor habitual. In the case of the lion Nero, at Warwick, when baited by dogs, his noble nature was hardly roused by the attack, which he in no way repelled by becoming the assailant, but contented himself by striking down with the immense force of his paw those of his opponents which ventured too near him; and when they actually fastened on him, he roared with fear and would have fled had escape been possible. Confinement, however, quells the courage and subdues the natural disposition of every living creature. The trapped wolf has been known to have been intimidated and to have offered no violence to the hunter who accidentally fell into the same pit, and both the lion and the tiger have permitted dogs to become inmates of their cages, when their original introduction was intended for a far different issue. But there are instances in which confinement enables us to see some traits in the characters of animals, which would be impossible to us in their state of freedom. Combativeness is natural at certain seasons, particularly among birds, and their conduct towards each other explains to a degree, but not to the extent which could be wished, the singular fact that dead or dying animals are rarely found. A covey of partridges, for example reared from the hand, will live in a state of harmony, like poultry, till the pairing season, when the males begin to fight among each other; the weakest is set upon by the rest, its feathers are torn from it, and raw wounds are formed, which being perpetually pecked at, give the bird a most pitiable appearance. It skulks in corners and tries to conceal itself, and moping thus for a few days perishes. Thus in a state of freedom both animals and birds, when ill, wounded, or shorn of their plumage, become the objects of attack from others of their own species, and are driven to conceal themselves in sequestered spots and thickets, whence they seldom reissue. An injured or persecuted dog, flying yelling through the streets, is chased and assailed by every other one of its species within hearing: a trait strikingly akin to the conduct of mankind. Some of the grouse species and the ruff, whose generic name of *Tringa pugnax* is most aptly given, fight in the most violent manner at the pairing time, and the latter so peculiarly so that it is lost to a sense of its own safety, and is taken easily by the fowler while under the influence of fury. The cock-of-the-wood, one of the most vigilant birds, and therefore difficult of approach, falls a prey to the sportsman from other causes. Perched on a stump or a small eminence in the early mornings of spring, it deploys its plumage, much after the manner of the turkey cock, crowing and displaying the most extravagant and stately gestures, till it is lost in the ecstacy of self entrancement, during which time it is unconscious of everything else, and is hence called "glougar," or deaf bird, by the Russians, who avail themselves of that moment to get within gun-shot of it.

Birds in cages are not exempt from petulant irritability and a spirit of pugnacity. Males of the grosbeak and bullfinch fight violently, and the tomtit directing its blows at the skull of its adversary soon destroys it. Even the delicate humming bird is notorious for its spirit of combativeness at certain periods; when two males meet at the same flower a battle immediately ensues; they mount into the air uttering their tiny note of defiance, and darting at each other till their minute forms are lost to the eye.

There is something highly exciting and heart-stirring in fights between animals in a state of nature, which is probably enhanced by their not being witnessed with impunity—for in many of our pursuits the sense of danger actually gives a zest to the scene. In our own country these opportunities are rare, but the wild cattle in Chillingham Park, and deer at certain periods are dangerous to approach. The combat between two stags with their passions fully roused is certainly a spectacle of absorbing interest, from the elegance of their attitudes, and the fury with which they rush together, clashing their antlers and contesting every inch of ground. Either death ensues, or the victory is rendered complete by the flight of the weaker animal. Such combats take place among the wild deer at large, but they have never been witnessed, for the deer keepers or lookers in the highlands of Scotland, have only been able to establish the fact from finding occasionally two stags of the red deer lying dead together. These displays, are, however, confined to that period of the autumn when the stag seeks the company of the does, of which he collects a small herd, watching over it with the most jealous eye, and expelling every intruder on his domain. Restless and bellowing he is ever in motion, and with head erect and eye dilated, his whole being seems lost in passion and excitement. By an undoubted arrangement of Providence to render the races of animals as perfect as possible, the females invariably attach themselves to the strongest and victorious male, deserting entirely their former master should he have been worsted in a battle for their possession. At this season the nature of the stag seems to be entirely changed, his habitual terror forsakes him, and he no longer flies at the approach of man, but assumes even a character of danger and defiance.

The utmost art has only succeeded in a few instances in subduing the passions of carnivorous animals, and even then there is always a feeling of danger, such as would be experienced by holding a naked candle in the midst of gunpowder; it may explode at a moment, and real confidence can never exist. The cheetah, or hunting leopard of India, which is reclaimed as far perhaps as is possible, must not be disappointed. Loosed from its cart, and directed towards its prey, it steals snake-like along the ground till within distance for its fatal spring; but, foiled in the effort, it returns sulky and disappointed to its master, and must be pacified by food. The excited tiger faces its pursuers, and, with kindled eye and maddened rage, deals terror around him, that even the practised elephant flies in an ecstasy of fear, with trunk erect and flapping ears, regardless of the power of his mohout; or, wounded and crushed to the earth, he gnashes forth his curses, as it were, in the very impotency of his rage. The opportunities of witnessing the display of the passions of this class of animals are rare if not impossible, nor can they be well imagined; but living by rapine, and at war with almost every other creature, they must be of the most terrible character. The poor caged animals we see can convey but the shadow of an idea of their real character; a quarrel in the den is a mere scuffle, and the impatient pacing of its limits as the feeding hour approaches, and the savage gloating over its food, are but weak outlines of the reality. Teeming with animal life, the forests of the East and the deserts of Africa are the deposits of Nature's hidden mysteries, and of the exciting causes of action in a large portion of her creatures. The ocean too is not without its scenes of strife, but here again we are precluded from more than a chance display. The conflict between the sword-fish and the whale is of the most terrific character, and doubtless in the hidden depths fierce and contentious passions agitate its repose. Descending lower in the scale, we find angry and deadly passions even in the minute forms of the insect world. In some the display is manifest and distinct, while in others it is only shown in their immediate actions. Witness the ant; its bodily construction prohibits any expression of its passions, but its gestures prove that it is not deficient in them: solitary individuals fight with the utmost desperation, and whole armies sally forth, as if by preconcerted arrangement, to match their strength, or to dispute some territory or settlement. That so small a body should be endowed with life, and with instinct so powerful that it resembles the profound knowledge of the mathematician and the skill of the engineer, is indeed wonderful, but it is still more surprising that it should possess passions so violent that, were its size commensurate with them, it would rule undisputed master of the soil. This is another proof of the wisdom which, in creating the universe, so harmonised it that the passions of each race of beings should be graduated according to their size and the effects on each other. The more deadly the creature, the more solitary are its habits; thus the scorpion is always found singly, and the carnivorous beasts never associate together, and they multiply less quickly than those which are essential to man. Well may we say, "O Lord, how manifold are thy works; in wisdom hast thou made them all; the earth is full of thy riches."

Emulation is a singular and striking characteristic of the feathered race. The bold clarion of defiance of the cock is responded to by every other within hearing, and each challenge, as it were, calls forth louder and more emphatic tones, as ruffling himself and strutting with increased importance, he strains himself to give them additional force. Canaries and some other singing birds hung in cages in the same room attempt to outvie each other in the shrillness and continuance of their song, and this also occurs to some extent with birds in a state of freedom.

Attack and defence call forth perhaps some of the most beautiful combinations of effect and passion which can be conceived, as, for instance, in the secretary bird and the snake. In an instant the former circumvents its intended prey; its escape is hopeless, it instinctively feels itself in the presence of its deadly enemy, and for the preservation of life prepares itself for the fearful encounter. Half erected, with gleaming eye and its body coiled or straightened to meet the exigency of the moment, it faces its ever active foe; it writhes and sweeps the ground with the convulsive movements of its tail, and, like the skilful fencer, acts on the defensive till the opening for the fatal lunge presents itself; but the wary bird allows no such advantage, for, dropping its wing, shield-like before it, it repels every attack by prostrating the serpent by the powerful action of its pinion, and, leaping rapidly behind it, secures the victory and its prey by a well-directed blow on the skull. This is a beautiful picture; the issue of life is in the struggle, of which Nature is the prompter, and in which the energies and passions of both creatures are worked up to their highest pitch. Dreaded by every other living creature, the snake here encounters its mortal enemy, ordained by the hand of Providence to keep its race within due limits. The terror caused by the snake must be almost witnessed to be understood, for it seems to be instinctive. Animals fly and shelter themselves at its approach, as if they also felt the influence of the original curse, and it consequently has recourse to stratagem and concealment to obtain its prey. The power of fascination seems to be limited to the rattle-snake, and how singular is that power! Arrested in its flight by the basilisk eye of the creature, the birds and small quadrupeds shriek in helpless agony at the spell cast over them, and if no friendly circumstance should break the enchantment, they perish from the mere violence of their emotions.

Monkeys on board ship entertain an unconquerable aversion even for the captive snake cooped up in a box, and cannot be reconciled to its presence.

The terror exhibited by animals, as we ordinarily see it, does not strike very deeply on our imaginations, either from its passing nature, or from the scene being got up, as in the chace, for our amusement; but the effect of that helpless terror, which assails the animals, when its instinct forewarns it that it is being hurried to irresistible destruction, defenceless and without the power of escape, must be acutely painful. Such a scene on a large scale was witnessed at the falls of Niagara, and is described as having been awfully grand. It was determined to send a large ship over the falls, and accordingly a vessel was prepared above the rapids, and set afloat with a mixed assortment of bears, buffaloes, and aquatic birds on board. As soon as it felt the irresistible force of the current, and was gliding rapidly towards the falls, the animals became conscious of their impending fate, and tore violently about the deck, bellowing in helpless despair; the screams and howlings are stated to have been heard till they were quenched in the thunder of the waters; two bears, when too late to struggle against their impending fate, leaped overboard and attempted to reach the land, but they too were swept on by the resistless torrent, and were hurled over the dreadful precipice. This was no ordinary terror; no enemy assailed them, and no natural causes threatened them, and yet their sagacity revealed to them their danger and helplessness. The annals of animal life do not present a more forcible instance of conscious helplessness and despair.

The last and most powerful passion in animals is their *στοργη* or affection for their young; every other feeling and emotion is absorbed by it, and their characters are changed into the most opposite extremes, the timid becoming bold, and the ferocious humble. The instinctive principle of self-preservation is lost in their anxiety to protect their offspring at every risk, and even death loses its terrors. The spider clings to its cocoon of eggs with resistless tenacity, and will perish rather than abandon it; the timid bird flies at the face of its spoiler, follows him, and enters willingly into the cage which confines its brood. The tiger pursues the robber of its young to compel restitution, and as cub after cub is thrown to it to give time for escape, it places them in safety, and pushes on again on the track of the hunter. The partridge and lapwing employ the most ingenious devices to protect their young from the danger of an intruder, and the domestic hen attacks indiscriminately every disturber of the safety of its brood. The caged young birds have been fed with the same assiduity by their parents as if they were free, and the old owl has discovered the prison of its young, and has supplied it with the most enduring affection.

There are many affecting traits on record, of the conduct of animals when bereaved of their young or in danger with respect to them. One of the most remarkable, and perhaps the best known, is that of the polar bear as given in the narrative of a whaling expedition published some years since. We know our own hopeless anguish, and the helpless and unavailing efforts to recall the spirit whose departure we cannot believe in or imagine to be real; we have yielded to the dreadful agony which clings to the prostrate form to awaken it from slumber, uttering the most endearing epithets to rouse it from the sleep which we seek to persuade ourselves is not the sleep of death. The poor bear hardly did less than this; it collected its cubs which had fallen under the destructive fire of the crew of the ship, it tried to raise them to entice them to follow her, and fetching lumps of whale's blubber lying around, placed it before them with vain efforts to rouse them with the food. Faithful in her duties to the last, she refused to leave them, and fell a victim to her extraordinary affection.

A monkey in the West Indies was surprised in an open spot with its young one; escape was hopeless, as there was not a friendly tree near the place; clutching its cub convulsively to it, it waved its disengaged arm in the most expressive manner, as if appealing to the feelings of the man in behalf of its young. The dog and cat whose offspring have been drowned, will recover possession of them, and transporting them to a place of safety, dry them and use every effort to resuscitate them. Animal history is rich in these striking traits of devoted affection which must touch even the heart of stone; and in desperation of purpose and recklessness of consequences, they are hardly excelled in their degree, by the unexampled courage of the woman who climbed the fearful precipice to rescue her child from the eagle's nest.

Self-preservation is the imperious and ever active feeling or passion in all creatures: with man it pervades every action and thought of his life; his food, rest, and occupation are influenced by it, his recreations are regulated by it, and in moments of danger it is the all-absorbing principle: with animals their whole instinct and energies are employed in the same end, in shunning and flying from their enemies, in their precautions against danger, in their extreme watchfulness, and in their jealousy against surprise and artifice. Mankind has arrived at its knowledge of its numberless dangers by experience founded on ages, but the animal intuitively adopts its precautions almost even before it can know the nature of the danger it seeks to avoid; it steps into the maturity of instinct at its birth, and the animal of to-day is not a bit more guarded and vigilant than that which existed three thousand years ago. Natural enemies and artificial devices are its only fear; it shuns no disease and dreads no distemper, for although liable to the same ills as mankind, a gracious Providence seems to have graduated their share of evils in proportion to their scale among animated beings. "The terror by night and the arrow that flieth by day" limit their apprehensions, to use a figurative expression, while their consciousness happily does not reach "to the pestilence that walketh in darkness, nor the sickness which destroyeth in the noon day." Flight we can conceive to be a natural endowment, and vigilance to be a display of instinct, but artifice, as used by some animals, shows a power of reasoning and a combination of ideas which are most surprising. The most refined intellect could not suggest a more perfect mode of destroying the scent which guides their pursuers, than that adopted by the deer and fox when they take to the water, follow a hard road, or run down the wind. Whence arises this consciousness, that the natural odour of their bodies, which we call "the scent," is the vehicle of the danger they seek to escape from! It is displayed only by animals of the chace as far as our experience extends, but we cannot infer that it is confined to them alone, as other animals might exercise it, if driven by the sense of immediate danger and the terror of pursuit to the full stretch of their instinct. But is this power slow in its operation, that it is only acted on when the chase is hot, and the failing energies of the animal compel it to seek to baffle its pursuers by every artifice and cunning? The terror which enjoins flight would also induce the adoption of that scheme which would ensure safety the soonest, and yet it is only when the animal is hard pressed, and its wearied limbs begin to sink beneath its exertions, that it has recourse to stratagem. The chase can afford it no pleasure, and the ruling principle of self-preservation gives wings to its flight, and yet miles are traversed, as if flight could destroy the scent which the animal only seeks to allay in its agony of despair.

Self-preservation seems to be an inherent principle in animals; a dread of pain and suffering, and a consciousness of death, which consciousness must be of the highest order in some animals, since they feign that death as the last remaining struggle for self-preservation, when all other hopes have failed. An implanted knowledge of the termination of life must exist, or its effects would not be feigned, nor the anxiety for safety be so paramount an object. It cannot be example that sets the fox to simulate death so perfectly, that he permits himself to be handled, to be conveyed to a distant spot, and then to be flung on a dunghill. The ultimate hope of escape prompts the measure, which unaided instinct could not have contrived. What we, humanly speaking, call knowledge of the world, which is the main spring of half our acts and plans, is the result of deep observation of character, and of the leading principles which influence society; and this would apply very well with fox in relation to fox, but the analogy must cease here, and we can only say that this artifice of the fox is an extraordinary display of high cunning, great self-confidence, and strong resolution. There are many insects, particularly the genus *Elater*, the spider, and the dorr beatle, which feign death when seized by the hand.

Suspicion, and the fear of stratagem, are strongly developed in the conduct of some animals. The tiger and bear, for instance, will not touch an animal as long as it be tied to a post, or tethered to the ground, dreading it as a bait for their destruction; but the moment it is at liberty they attack it freely; crows and some other birds will forsake their favourite resorts, if strings be suspended on sticks at different angles over the surface. Most gregarious birds and animals place a vidette or scout on an eminence to give them timely notice of the approach of danger, and so well are the signals understood also by other creatures, that they take advantage of them to secure their own safety. The noisy scream of the jay alarms the whole circle within hearing, and both the predatory fox and the cautious sportsman are baffled in their pursuits. The vigilance both of the chamois and red deer is such that the utmost art and patience are required to approach them, and the wild sheep or mouflon of the Caucasus utters a loud whistle at the signal of danger.

To the true naturalist these incidents of the character and passions of animals, are what the study of the human mind is to the philosopher; and to embody them how many have left the world and haunts of man! The most remarkable instances of this all-absorbing passion are to be found in the persons of Audubon and Wilson, whose lives, particularly the latter, were spent in the woods and wild districts of America. The former excels in his descriptions, which none but the most ardent admirer and observer of nature could express in such graphic terms. He gives the following description of the white-headed eagle on the banks of the Mississippi:—"The eagle is seen perched, in an erect attitude, on the highest summit of the tallest tree, by the margin of the broad stream; his glistening but stern eye looks over the vast expanse. He listens attentively to every sound that comes to his quick ear from afar, glancing now and then on the earth beneath, lest even the light tread of the fawn should pass unheard; his mate is perched on the opposite side, and, should all be tranquil and silent, warns him by a cry to continue patient. At this well known call the male partly opens his broad wings, inclines his body a little downwards, and answers to her voice in tones not unlike the laugh of a maniac. The next moment he resumes his erect attitude, and again all around is silent. Ducks of many species, the teal, the widgeon, the mallard, and others are seen passing with great rapidity, and following the course of the current; but the eagle heeds them not; they are at that time beneath his notice. The next moment, however, the wild, trumpet-like sound of a yet distant but approaching swan is heard. A shriek from the female eagle comes across the stream, for she is fully as alert as her mate. The latter suddenly shakes the whole of his body, and with a few touches of his bill, aided by the action of his cuticular muscles, arranges his plumage in an instant. The snow-white bird is now in sight; her long neck is stretched forward; her eye is on the watch, vigilant as that of her enemy; her large wings seem with difficulty to support the weight of her body, although they flap incessantly. So irksome do her exertions seem, that her very legs are spread beneath her tail, to aid her in her flight. She approaches, however. The eagle has marked her for his prey. As the swan is passing the dreaded pair, the male bird starts from his perch, in full preparation for the chase, with an awful scream, that to the swan's ear brings more terror than the report of the large duck gun.

"Now is the moment to witness the display of the eagle's powers. He glides through the air like a falling star, and, like a flash of lightning, comes upon the timorous quarry, which now, in agony and despair, seeks, by various manœuvres, to elude the grasp of his cruel talons. It mounts, doubles, and would willingly plunge into the stream, were it not prevented by the eagle, which, long possessed of the knowledge that by such a stratagem the swan might escape him, forces it to remain in the air by attempting to strike it with his talons from beneath. The hope of escape is soon given up by the swan. It has already become much weakened, and its strength fails at the sight of the courage and swiftness of its antagonist. Its last gasp is about to escape, when the ferocious eagle strikes with his talons the under side of its wing, and with irresistible power forces the bird to fall in a slanting direction upon the nearest shore.

"It is then that the cruel spirit of this dreaded enemy of the feathered race may be seen; whilst exulting over his prey he for the first time breathes at ease. He presses down his powerful feet, and drives his sharp claws deeper than ever into the heart of the dying swan. He shrieks with delight as he feels the last convulsions of his prey, which has now sunk under his unceasing efforts to render death as painfully felt as it can possibly be. The female has watched every movement of her mate; and if she did not assist him in capturing the swan, it was not from want of will, but merely that she felt full assurance that the power and courage of her lord were quite sufficient for the deed. She now sails to the spot where he eagerly awaits her, and, when she has arrived, they together turn the breast of the luckless swan upwards, and gorge themselves with gore."

In another place, in speaking of the magnificent new species of eagle he discovered and named "The Bird of Washington," he says:—"In high expectation I seated myself about a hundred yards from the foot of the rock. Never did time pass more slowly. I could not help betraying the most impatient curiosity, for my hopes whispered it was a sea-eagle's nest. Two long hours had elapsed before the old bird made his appearance, which was announced to us by the loud hissings of the two young ones, which crawled to the extremity of the hole to receive a fine fish. I had a perfect view of this noble bird as he held himself to the edging rock, hanging like a barn, bank, or social swallow, his tail spread and his wings partly so. I trembled lest a word should escape from my companions. The slightest murmur had been treason from them. They entered into my feelings, and, although little interested, gazed with me. In a few minutes the other parent joined her mate, and, from the difference in size (the female of rapacious birds being much larger), we knew this to be the mother bird. She also had brought a fish; but, more cautious than her mate, she glanced her quick and piercing eye around, and instantly perceived that her abode had been discovered. She dropped her prey, a white perch weighing about five and a half pounds, with a loud shriek communicated the alarm to the male, and hovering with him over our heads, kept up a growling cry, to intimidate us from our suspected design."

The reflecting mind cannot part with this subject without confessing the benevolence of the Creator in all his works;—he finds the animal world stored with the means of comfort and happiness, possessing powers almost approaching to human intelligence, virtues worthy of imitation, and industry, courage, and affection which cannot be excelled. The stamp of the Deity who "has filled all things living with plenteousness" is upon them, and therefore the criminality of abuse and cruelty is great. The mind destitute of mercy is callous to the world, and lost to the fear and love of God, and being blind to the beauties of the creation, is without fervour in his admiration of the Creator. Insensible, and hardened to everything but the world's pursuits, the joyousness of nature calls forth no kindred feeling, and the sufferings he witnesses elicit no spark of sympathy. A kind word and a benevolent action will be held in remembrance at that time, when "the wolf shall dwell with the lamb, and the leopard shall lie down with the kid; and the calf and the young lion and the fatling together; and a little child shall lead them."

# THE ANIMAL WORLD.

No person can have read the first chapter of the book of Genesis without wondering at the vast tale which is there narrated with so much simplicity and power. The sublimity of the subject is alone approachable by our understanding, for it is equally as impossible for the mind to grasp the Divine proclamation, "Let there be light," as to conceive the formation and endowment of the animal world. Stamped with instant perfection, and varying only in its original characteristics from the curse it shared with our first parents, we find it now as when it first issued from his hands. The subject, like the bridge in the vision of Mirzah, rises from a cloud at one end and loses itself in a mist at the other. The creation and final destiny of mankind have been revealed to us, but as regards the numberless other beings which inhabit the world and surround us, we only know that the waters and the earth brought forth abundantly at the Divine command, without being able to hazard a conjecture as to their revival in another life, against which no argument can be advanced nor proof produced. Endowed as they are with intellects, memories, passions, and instinct, almost approaching to reasoning powers, it is as difficult to assign annihilation to them, as it is to embody the idea of annihilation with the principle of life. They have their portions of care and anxiety, and are susceptible of all the emotions of distress, fear, pain, and death. They possess therefore something more than the bare principle of existence, which however cannot be defined, as our own ideas and knowledge can only extend to the reality and responsibility of a reasonable soul. The doubts and speculations to which this point is open, are of themselves sufficient to awaken in us a proper feeling of admiration at the wonders of the creation, could we even lose sight of the multiplicity of its objects, their aptitude to place, and the thousands of other arrangements combined in so perfect harmony. The expansion and enlightenment of the human intellect can only suggest reasons in favour of either principle, without advancing a step nearer to the important truths than that which existed centuries ago. Dismissing the absurdities and impiety of the Pythagorean doctrines, we naturally fall back on the entertained opinions of the children of nature, to learn what belief or notion is upheld by them in their wild and unreclaimed state. The idea of a future existence is generally prevalent among them, whatever may be their worship; and the North American savage, especially, believes that animals share the same destiny. As death approaches him, he calmly resigns himself to the "Great Spirit," and is buried with his weapons for the chase, in the full belief that he will be transported to the "happy hunting grounds," where he will enjoy the pleasures of the sport without the knowledge of the cravings of want, or of the sufferings of fatigue.

Whatever opinions we may presume to form on this subject, they ought to be considerably influenced by the consideration, that as animals were at first formed so we find them now, their intellects admitting of no expansion and their faculties of no improvement, and that thus the sentient principle may not be preserved after the extinction of the vital one, although the dissolution of the former may seem to be incompatible with what we know of the imperishability of the spirit. But here a curious contradiction seems to present itself if we figure to ourselves an idiot: we see in him the lineaments and form of a human being, but endowed with no consciousness and enlightened by no understanding, less than the brutes in their instincts and inferior to them in capacities; and yet who will dare to express a doubt as to his future existence! These reflections suggest themselves naturally to us as we survey the animal world, and if divested of the impertinence and impropriety which would seek to pry too boldly into the hidden mysteries of the creation, we cannot rise from them without entertaining a deep veneration for the divine Agent, and a gentler spirit towards the creatures of his bounty, whose position in the scale of life is one of unfathomable mystery and doubt.

If we examine them collectively merely in their organic forms, how beautiful is the link which connects them in all their gradations and changes, each order gliding almost imperceptibly into the other, free from discordant or violent opposition. Beginning with man, biped and erect, we come to the monkey which forms the natural connection between him and the quadruped, which, descending gradually in the scale till it comes to the lowest ranks of its species, divides itself into two branches, and in the new forms of the bat and the seal, connects itself with the denizens of the air and the inhabitants of the deep; and later discoveries have even proved that this wonderful combination extends one degree farther in the construction and habits of the Ornithorynchus paradoxus, which uniting in itself the form of a quadruped, the bill and mode of feeding of a duck, with the water for its element, embodies thus in itself the connection between the three kingdoms. But the intervening links, before we come to these two great ramifications, are most beautiful and perfect, and lead us by the most gentle degrees to the great issue; as, for instance, in the squirrel, which is provided in some of its varieties with a membrane on its side, connecting the fore and hind legs, which, when extended, materially assists it in the vast springs it takes from tree to tree; the additional power of flight to the bat is an easy and natural progression in the great chain.

On another side we see the gradation to the lowest order of creatures take place with the same gentle transition; the limbs of the animal becoming by degrees less and less developed till we come to the serpent and the worm. Thus also in the insect world, we follow the perfect coleopterous insect with its cased wings to the half defended staphalinidæ, till through many successive steps we reach the defenceless and less perfect form of the cimex; or we may pursue the same course with the perfect four-winged fly to the dipterous insect, till at last, after finding mere rudiments of wings, we finally stop at the aptera or those without wings. But the chain is not yet severed, as even another, the vegetable kingdom, must have its connecting link to render the transition complete, and this the zoophite, partaking in its nature both of the animal and vegetable world, effects.

The scientific classification of the different kingdoms of nature proves clearly in each separate branch the truth of these remarks; but it must depend materially on observation and comparison to establish the points themselves. It is easy to descend step by step from the noble oak to the poor lichen, and thence to the tangled sea-weed, yet we view them each separately, or prize them only as they are valuable or useful to us. We look in vain for a spot entirely desolate and barren; the curse is upon the earth as regards the wants and necessities of man, but the divine precept, "let the earth bring forth grass, the herb yielding seed, and the fruit tree yielding fruit after his kind, whose seed is in itself, upon the earth," is ever active. The barriers of the north, the regions of the Alps, and the fiery heats of the tropics are equally unable to resist vegetation. Precarious in their produce, and subject to the desolating effects of the seasons, the unthankfulness of the soil, and the destructiveness of the insect world, the fruits of the earth available for human sustenance are the results of anxiety and toil, while the worthless and rank weed shoots up in defiance of obstacles, clinging to crevices in the walls, and disputing almost the territory of the waters. Incessant labour alone keeps it within bounds, without which the land returns to its original wilderness, and the track or vestige of cultivation is lost in its luxuriance. Familiar as this is to us, the gigantic operations of nature in the tropics appear less astonishing, although we know that crowded cities have given place to pathless forests, and that vegetation has usurped the dominions once enjoyed by man. How striking is this moral, and how forcibly does it prove the evanescence of human things! The discovered cities of Central America, buried in the almost impenetrable jungles, alone remain in their ruins, to proclaim the existence of a people, of whom neither history nor tradition can give a clue, nor does a trace remain to show by what mighty revolution or agency they were dispeopled, while the vast forest waves over them in undisturbed majesty and vigour.

Dense as these forests are, and carpeted as the earth is with vegetation, the shade afforded by the one, and the maintenance supplied by the other, are essential and indispensable to the comforts and existence of the animal world. With very few exceptions as to locality, the earth teems with life in numbers so vast that computation is impossible, and the imagination is unequal to comprehend them, and yet there is no crowding, no undue preponderance, but the balance is so beautifully preserved that the wants of all are supplied, and conflicting passions and appetites produce no confusion. Crouched in their lairs, deep in the fastnesses of the jungles, the carnivorous animals maintain their undisputed dominion; the open lands and boundless savannahs swarm with herds of antelopes and other peaceful tribes; the ostrich, giraffe, and zebra enliven the trackless desert; monkeys, squirrels, and the winged denizens of the air people the lofty trees, even the swamps, fatal to other creatures, are a habitation for reptiles; and hardly a plant or shrub exists which is not instinct with insect life, while myriads have their being beneath the surface of the earth, or are there undergoing their metamorphoses before they emerge in their perfect state.

"And God said, let the waters bring forth abundantly the moving creature that hath life;" with a new element new wonders meet our contemplations, for if we fail in our attempt to pass in review before our mind's eye the hosts of the creation of the terrestrial world, how much more impossible it is to venture even a glance at the innumerable legions which inhabit the waters, from the gigantic whale to the animalculæ in a mere drop. In such a drop, under strong magnifying powers, we have seen a world of rapacious monsters, gamboling about with ease, and devouring others of their kind, and these beings, invisible to the natural eye, are as perfect in their formation as the whale, whose stupendous bulk derives its nourishment from creatures almost as invisible and as unsubstantial. The beautiful fictions of the heathen writers peopled the waters with the most lovely beings, and described their abodes, and the valleys and groves of the deep, in the most delightful imagery; and who can say that the latter have been over-painted! The storm sometimes throws upon our shores fragments of marine productions torn away by the convulsions of the element, and these prove incontestibly, were other evidence wanting, that the bed of the sea is by no means barren. In beauty and variety of form and splendour of colour, its inhabitants vie with those of the other kingdom, and on the same principle they descend step by step in the scale of life, from the perfect fish to the helpless limpet. The stages downwards are highly remarkable, and particularly at that point where the shell-fish first presents itself. With the lamprey the finny tribe may be said to cease, and presently we find a race of which we may take the hermit crab for an emblem, which being only partly crustaceous, with its extremity unprotected, insinuates itself into the empty shell of the whilk, and thus secures itself from injury. Shell-fish, multivalve, bivalve, and univalve succeed; and at last, after passing through the order of zoophytes, including the sponges and corals, the connected chain of animal life ceases, as far as our knowledge extends, with the infusoria in a drop of stagnant water.

It is impossible to leave this portion of the subject without glancing at the powers and contrivances with which marine animals are furnished for their protection and defence. The whole tribe of flat fish, whose speed in swimming is limited, have the upper surface of their body brown and spotted to assimilate to the sand and mud on which they lie; the flying-fish raises itself from the water by the wing-like process of its fins, and passes in the air to the distance of several hundred feet to avoid its active and constant foe the dolphin; the scuttle fish, by discharging an ink-like substance from its body, discolours the water around it, and is thus lost to its assailant; the lobster by a spontaneous effort deprives itself of a limb to secure its escape; and so in numberless instances are the means of safety afforded; while on the other hand the voraciousness of the shark is restricted by the peculiar formation of the upper jaw, which, by protruding far over the nether one, incapacitates it from seizing its prey without turning on its side. Speed is however the principal means of safety with the greatest portion of fish, and it is not the least surprising part of their organization that such extraordinary velocity can be obtained by the mere action of the tail. Its power is perhaps best understood when we consider that a salmon, by a convulsive effort of that member, will leap a fall of twelve feet water, and stem the torrent at the very verge of the precipice. By the same means the whale is enabled to throw his huge mass out of the water to a considerable height. Captain

Hall says that he saw a whale which was entangled among some coral reefs, spring out of the water to a perpendicular height of twenty feet, from which he fell back again into the sea with a thundering crash; and Captain Scoresby says that he has witnessed many similar exploits of whales in their freaks, leaping so high out of the water as to be completely in the air, which could not be less than twenty feet:—they have besides been known to cut a boat in halves by a blow of the tail.

This brief glance at the several divisions of nature suggests ideas as to their formation, multiplication, fitness to place, and powers of movement.

As regards the multiplication of the different species, the arrangement by which it is restricted in some and increased in others, according to the duties they have to perform, and the relative importance they bear to each other is indeed admirable: the increase bearing so exact a proportion to the consumption, and the necessities of the various tribes, that the balance is never disturbed. The carnivorous animals and the larger quadrupeds are the least prolific; the former, because their numbers would be dangerous, and their rapacity would devastate the earth; the latter because they would desolate the land by trampling down vegetation, and by the enormous quantity they would consume, and besides these two classes have no natural enemies to contend with; the sanguinary character of the one and the bulk of the other securing them from violence, and leaving them subject only to disease or accident as the causes of death: the wisdom, therefore, of this restriction is as manifest as it is gracious. Of herbivorous and other animals essential to man either as food or for his other purposes, the increase is surprising, and exactly proportioned to his necessities, and to the means the earth affords for their subsistence; and this rule applies equally to the wild districts, where the savage tribes, in supporting their existence, check the exuberance which would otherwise be an evil rather than a blessing. But the increase so necessary to keep up the chain of life, by adapting the numbers on the one hand to the necessities on the other, does not end here; for there are other functions to be performed, and other benefits to be conferred, and accordingly we find that those animals, which act as scavengers on the earth, cleansing it from impurities and putrid substances, are extremely prolific. It is worthy of remark, too, that according to the average period of life assigned to them is the increase of the species regulated, and the period of their arriving at maturity settled. The elephant, for instance, which does not reach its full standard till the fifteenth or twentieth year, lives to a great age, and only produces its young at distant intervals; while the smaller animals, subject to many enemies and casualties, and restricted to a short period of life, acquire maturity in a few months, and have numerous offspring, and frequent litters.

The increase in animal life seems to be regulated entirely in proportion to the enemies it has to contend with ; thus, as has been stated, the most powerful are the least numerous ; and the most serviceable, either from the benefits they confer, or as affording food for others, are the most abundant. The distinctions between the feathered race in this country are sufficient to illustrate the fact. The eagle rears its two or three young ones on a wild inaccessible crag, and expels them from the district when able to maintain themselves, as if the territory would not afford supplies for all, or because Providence has decreed this separation to scatter these scourges of animal life:—we search for them in vain, and nowhere is an increase among them perceptible.

> "High from the summit of a craggy cliff
> Hung o'er the deep, such as amazing frowns
> On utmost Kilda's shore, whose lonely race
> Resign the setting sun to Indian worlds,
> The royal eagle draws his vigorous young,
> Strong pounced, and ardent with paternal fire,
> Now fit to raise a kingdom of their own,
> He drives them from his fort, the tow'ring seat
> For ages, of his empire ; which in peace,
> Unstain'd he holds, while many a league to sea
> He wings his course, and preys in distant isles."
> THOMSON.

The smaller birds multiply to an extraordinary extent, many rearing from ten to fifteen young at a time, and others having two broods a year ; among the former the granivorous birds may be placed, and to the latter the insectivores and migratory birds especially belong. The one by its numbers provides for the continuance of its race beyond what is required for human food ; and the other keeps within due bounds the myriads of insects which would otherwise infest the earth like an Egyptian plague. The aquatic birds which prey on fish lay seldom more than two eggs, because the labour to supply their young would be beyond their powers ; but the other species which dabble in the mud and feed on worms and frogs, and whose young readily assist themselves, have always large broods, first, because the food is easily procured, and secondly, because in its abundance it would soon overrun the land were its increase not kept within bounds.

With fish this danger is not to be apprehended, as their numbers can neither act prejudicially to other parts of the creation, nor dangerously to themselves, and, therefore, we see an increase permitted to them beyond either the power of language to express, or the fertility of the imagination to conceive. They have many natural enemies to contend with in their own element ; and the Divine mandate, that "man should have dominion over the fish of the sea," implied the importance they should be to him as food; and as God is lavish in his bounties to all creatures, can we refuse to acknowledge the goodness which made "the waters to bring forth abundantly," or to shut our eyes to the causes which render this prodigious increase subservient to his benevolent care!

On the subject of formation, the other two points, namely, fitness to place and powers of movement, may be said to be embraced in it, although, when not treating them strictly anatomically, they will bear to be separated. They cannot exist without the former, and are mainly dependent upon it; but some exceptions are to be found, in which the animal of one country adapts itself to the climate and peculiarities of another.

The effect which the outward formation of animals produces on our senses, is that of wonder at the astonishing variety which stamps the creation. This is obvious to the most indifferent mind, which, blind to the beauties of nature, sees nothing but the external form, without troubling itself with a thought as to the causes, uses, and applications of the parts which have attracted its notice. It is not sufficient for us to know that the elephant is provided with a proboscis, or that the giraffe has an unusual length of neck: they were not created thus without a cause, or without a due regard to their exigences and comforts, and into these it behoves us to inquire, in order that we may thereby enrich our knowledge of the works of the Creator, and in our admiration extend our praise. The examples of the elephant and of the giraffe have been purposely cited, because, as regards the outward structure of animals, they are perhaps the most remarkable, and the most opposite. The former possessing apparently no neck, and for the wisest of purposes, because, from the immense weight of the head and its defences, it would be beyond measure helpless, and unable to supply itself with food ; the proboscis, therefore, was the means bestowed upon it to compensate for this apparent deficiency ; and further, this member is endowed with the most exquisite sensibility and delicacy of touch, that it can discriminate instantaneously between the substances before it, and select accordingly, when it would be impossible for its eye to perceive them. Conscious of the importance of this organ, it protects it with the greatest care, for, though safe in ordinary purposes in its case of hardened epidermis, it is thrown high in the air, and curled back over its head, should danger or attack threaten it. Another peculiar formation distinguishes this animal beyond all others, which is the power of bending the hind leg at the knee-joint, kneeling in fact with the hind legs, and thus reclining by an easier process, with regard to its great bulk, in comparison with other animals. The giraffe, inhabiting the same quarter of the globe as the elephant, frequents arid spots and the confines of the deserts, where pasture is not to be procured; and as its food is specially appointed to be the leaves and tender shoots of trees, its great length of neck was necessary to enable it to reach them, in which process it is assisted by the tongue, which it can protrude to some length, and curl round the twigs it browses on. Its thin graceful neck, surmounted by a snake-like head, is encumbered by no weight, and detracts in no way from the beauty and stateliness of the animal. Other animals feeding on the ground (that is grazing), have the cervical column exactly adjusted to the end in view, so that the mere dropping of the head produces a natural attitude, which can be preserved for any length of time without constraint or inconvenience. Carnivorous animals possess immense suppleness and elasticity of limb, by which they are enabled to make their fearful and fatal spring on their prey, which, possessing chiefly a greater power of speed than their own, would otherwise elude their attacks; and besides, the peculiar and cushion-like formation of the foot enables them not only to fall without shock or injury to the ground, but also to steal noiselessly along till within due distance for the leap. Moving chiefly by night through pathless and tangled thickets, the mere rustling of which would create alarm and give notice of their approach, they are furnished with a series of fine bristles emanating from the cheeks and the region of the eye, and protruding beyond the circle of the face, which are endowed with such an exquisite delicacy of touch as to enable them to avoid all obstacles, and may almost be called an additional sense. They perform also most probably other functions, and assist the organ of smell, by which alone they are guided towards their prey; but this is difficult of proof, and is only presumed from the fact that a cat whose whiskers were cut off was unable to mouse as before. The bristles around the mouths and nostrils of grazing animals, are evidently intended to disturb and brush away the insects which abound in the grass and other herbs, and would be noxious to them in their food. Rabbits, and other burrowing animals, have this appendage also by which their movements in the dark are regulated and assisted. The *vibrissæ*, or bristles, found at the root of the bills of birds, is confined to the insectivores, and is, therefore, doubtless intended to assist them in catching their prey, although the proof is not easy; but still, as those which take insects on the wing have this process more developed than the nightingale, redbreast, and flycatcher, which merely jerk about after those insects which come within their reach, it would seem to be absolutely necessary in their economy. The stout substances at the base of the bills of rooks, vultures, and eagles, do not belong to this category, and besides are not disposed in the same direction; the former, from plunging its bill much in the ground, require some defence in the region of the nostrils, and the latter without such a guard would be unable to preserve their plumage from the gore and reek of their prey.

The ear is another proof of the admirable construction of the outer animal, with reference to its habits. In the carnivorous animals it is stiff and strong in texture, so that it is not likely to be torn or injured in thickets and tangled covers, and it is lined within with a thick fringe of hair to prevent the entrance of wet. In the wine countries, where the cats do mischief to the vines by hunting among them for rabbits and small birds, it is the custom of the peasants to crop their ears, and thus, by depriving them of their safeguard against the drippings from the leaves, they entirely break them of the habit. Rabbits and hares which frequent long wet grass and low brushwood, not only have the power of throwing their ears back, but also of closing them flat, the length of them, too, however excellent as conveying the sound, on which so much of the safety of the animals depends, would be a serious inconvenience were they not furnished with this retractile power. The mole has no visible outward ear, the otter, water rat, and other amphibii have none or the slightest projecting membrane. Besides the protection against the entrance of wet and of insects afforded by the fringe of hair, many animals, like the horse, and donkey, have the power of dropping their ears when exposed to a pelting rain, and of erecting either one or the other, and pointing to the quarter whence the sounds proceeds which engages their attention. The sense of hearing with all beasts is certainly most acute, and the perception exercised by it is not a little remarkable. Habit reconciles one animal to a sound which creates alarm in another; a dog couched on the ground can hear a foot fall at an immense distance, and can distinguish between an accustomed one and that of a stranger. The furious barking of the watch dog at night, and the whining cry of recognition at the return of the absent master attest the fact.

In land birds, the external ear is faintly indicated by a small tuft of feathers, and the orifice is small; but in the owl, which forms an exception, and whose nocturnal habits require the utmost vigilance, the sense of hearing is evidently intended to assist that of sight, and is rendered extremely powerful from the size and external development of the organ, and also from the upper portion of it being arched, and protruding so as to catch the slightest sound in its ascent. In game birds this sense must be extremely susceptible, for, however keen their sight, it is impossible from their size, when hid in the long grass and stubble, that it can be a distant one, and yet they are immediately aware of the approach of an enemy, and lie wild to use a sporting phrase; that is, they will rise from one end of a field when a person enters at the other. It is also obvious that this faculty has been given to birds to a remarkable extent, for the same gracious purposes which stamp the rest of the creation, to enable them to distinguish each other by their cries, and to reunite, when lost to each other in the leafy barriers of the woods, or when scattered by violence or alarm. Partridges thus call to each other as evening approaches, and may be seen running swiftly along the furrows, and taking short flights, till the whole covey is united; or in the spring the male birds distinguish the call of the female and resort to her, so discriminating is their organ of sound. The French avail themselves of this knowledge to shoot à la chanterelle, as they term it; that is, at the pairing season they place a hen partridge in a cage behind a large stone as evening approaches, and her call attracting the males within hearing, they are shot by the concealed sportsman as they come up. The intention of this is not so unsportsmanlike as it appears, as it is really done to destroy the superabundant male birds, which would otherwise fight together, and so harass the hen that a covey would be lost, for none but the single males are attracted to the spot.

In aquatic birds the external ear is hardly if at all visible, but is covered with short stiff feathers to guard it against the admission of water. Some birds, like the eared grebe, are distinguished by a peculiar epithet, but that arises, as in some of the owl genus, from the ear-like formation of an ornamental crest, and not from any real exposure of the organ itself.

In speaking of the necks of animals, enough was probably said to point out and prove the perfection of the arrangement, as conducing to the comfort and mode of life of the animals themselves. And thus it is also with birds, but on opposite principles. The length of limbs in the ostrich requires a proportionate extension of neck to enable the bird to reach the ground with its bill to feed. The swan, which feeds principally on aquatic herbs growing beneath the water, reaches them with ease by means of its long and graceful neck; and the stork, crane, heron, and other waders, whose long bare legs are constructed purposely, so as to permit them to stalk to some distance in the water without injury to their plumage, would find their labour vain without their long necks, and powerful and pointed bills. While the feathers of land birds are of a soft and silky texture, those of the aquatic races are compact, of harder filament, and completely water proof, and so perfectly so that the soft down with which they are supplied next to the skin, as a proper protection in the cold element they exist in, is never affected by damp or wet. In some of the tribes, such as the penguin and other divers, the feathers partake almost of a horny character, and are stiff and harsh, like filaments of whalebone, and have the merest rudiment of a quill at their extremities. The ostrich and emu, which are incapable of flight, and to whom the usual arrangement of feathers would be useless, and inconvenient in a climate which they are never enabled to vary, are covered with a down-like feather without a shaft.

The tails of birds exhibit further proof of the perfection of their construction, and of the admirable contrivance provided for their sphere. Rudder-like, the tail directs their course, checks their flight, and allows them to alight with ease and gentleness of motion. When expanded, it assists the bird of prey to float apparently motionless in the air, and to perform those graceful gyrations which distinguish its flight; by curving it downwards the flight is arrested, and as the bird descends precipitately to the earth with closed wings, the action of the air, operating on its expanded surface, reduces the impetus of the fall, and permits them to alight gently on the earth. Some, indeed, like the pigeon, vary in this respect, by throwing up their wings at the moment of settling, and are not propelled beyond the spot they have selected; but the crow and others cannot arrest their impulse without a succession of several little leaps. To the wading birds the tail would be inconsonant with their habits, and detrimental to their comfort and safety, for, being wet and draggled by coming in contact with the water, the flight would be impeded by its weight, and the bird would be otherwise unequal to its functions. The length of the legs, which could not be contracted, and be bent close to the body, as in other birds, is therefore made subservient to this purpose, and supplies the otherwise apparent defect by being thrown backwards to their fullest extension, and by projecting far beyond the region of the tail, with which besides, but for its curtailed proportions, they would materially interfere. In the woodpecker and other climbers, the extremities of the feathers of the tail are harsh and elastic like whalebone, with the shaft particularly prominent, affording thus a prop or fulcrum as it rests against a tree, and its expansive power is also limited, as the habit of the bird rarely requires it to settle on the ground. The perfection and simplicity of this arrangement cannot be exceeded, and no other contrivance could enable the bird to maintain its position on the tree when throwing back its head to give due force to the bill, in hammering at the bark of the tree to perforate the hole from which its long tongue, with its feathered-like point, is to extract the hidden insect.

The importance of this appendage to birds, beyond anything which has been here stated, is self-evident, when we notice not only the awkwardness in their flight, if diverted, but it is also less rapid, and they tumble almost to the ground when settling, instead of dropping softly and without a shock to themselves. In some animals, as the kangaroo, this appendage is of a strong muscular character, and materially assists them in the surprising leaps they take, and with some monkeys its prehensile power is so great that, by coiling it round a branch, they suspend themselves without any other support. The feline race, when strongly excited and enraged, bristle up this member till it assumes a double size, and lash it with uncontrolled fury; and they extend it stiffly in a right line, when springing on their prey, as if to guide them through the air straight to the object they have been watching from their lair; the placid beaver is endowed with a peculiar and distinguishing quality, employing its tail as a rammer to drive the stakes which form its dam, and to spread the slime with which it cements its sides.

As regards the distribution of animal life over the earth, it was doubtless created entirely with reference to the locality it was to inhabit, and adapted expressly to the nature and peculiarities of those spots. Varying in every climate and in every soil, its fitness to them bespeaks the open-handed benevolence that placed it there to enliven the face of nature, and to assist in the great work of mutual assistance and dependence. To take, for instance, the camel, so appositely called "the ship of the desert," no human ingenuity nor contrivance could have suggested so perfect an organization to resist the dangers and desolations of the desert, whose moving sands and fiery droughts seem to present an impassable barrier, and to be fraught with death. Its spongy hoof traverses them without cracking, its internal reservoir enables it to dispense with drinking for several days, and in the absence of food, the absorption of its fatty hump prolongs its existence. The prickly shrubs, indigenous in the arid waste, are its natural food, and verdant pastures and shady retreats would be distressing to its existence. The stud of these animals maintained at San Rossora in Tuscany proves by their attenuated appearance, and reduced vigour, that they will thrive nowhere but in their desert home. In the earliest days mentioned in Scripture, they were reclaimed, and essential to the wants of mankind in those pastoral times, and to the present hour they are as indispensable to the wandering Arab. There is probably not an animal which has been domesticated and turned to useful purposes that does not also exist still in a wild state; but to this the camel forms the exception, and is a singularity not to be explained. The llama, which is the American type of the camel, is also used for purposes of burden, and is made to traverse the steep mountainous ridges with its load of ore, where even the sure-footed mule dare not adventure.

To pass to another climate, and to an animal whose life and powers form the staple of the inhabitants, we find the rein-deer. This animal is one of the very few which are indigenous both in the Old and New World: in the latter it is only found in a state of nature, but in the former the whole race is nearly reclaimed, and become subservient to the authority of the human race. Directed by the keenest sense, it discovers the lichens on which it feeds deep beneath the snow, and subsists easily in a climate where the face of nature is sealed up through long-continued months of winter. As a beast of burthen, it is invaluable to the inhabitants of the dreary northern regions; its broad expansive hoofs enabling it to pass over the yielding surface of the snow with ease. For domestic purposes, where no substitute can be found to meet even the limited wants of the inhabitants, its importance is incalculable; its milk furnishes them with cheese, its flesh with meat, its hide clothes them, and its horn supplies the material for implements of use. Like the camel it is formed for its own peculiar soil, and perishes if removed from its influence.

The generality, however, of such animals as have been reclaimed and domesticated, exist either naturally in every habitable part of the world, or, by the bountiful dispensations of Providence, adapt themselves to every climate. The ox, the sheep, and the dog are thus found in every possible variety, under every vicissitude of temperature; and although the horse is equally conformable in its constitution, and is reared to a high state of perfection in various parts of Europe, yet it nowhere attains to an incomparable point, excepting in the East, where the former animals deteriorate. Extremes of climate for the most part produce this effect, and extend their influence even to the human race, till beauty of form is lost and the capacity of the intellect is limited, as exemplified in the Hottentot and Esquimaux.

It matters not in what direction we look, or to which of the animal kingdoms we turn our attention, use, mutual benefit, and perfection of arrangement, meet our eyes; even the mole and the worm beneath in the earth are acting as natural drainers to the soil, and assisting in the great work.

Anatomy reveals to us the principles of motion in animals, but we are left to our own observations and conclusions for ascertaining why the modes of progression vary, not only in the different races of animals, but also among those of the same species. That this has not been done without some wise dispensation of Providence, we may rest well assured, although the cause may neither seem obvious to us, nor absolutely necessary to the animal, as far as our limited judgment may extend. Difference in formation naturally produces and explains one great cause, but the reason generally is not so well marked, although in some instances we find that the movement of the animal is peculiarly adapted to its manner of feeding. The hare tribe, with its short neck and long hind legs, would feed with difficulty in any other than a squatting position, which the nature of its food seems also to render requisite, and as its only safety consists in flight, this very attitude is the best which could be adopted to put it rapidly in motion.

It is in the walk that the peculiarity of movement in quadrupeds exists. The horse and deer move each leg alternately, but the ox and giraffe advance by moving the two legs of the same side of the body successively. In neither instance does it appear that this difference assists the animal in procuring food, for the horse and ox browse alike, and the giraffe depends on its long neck to reach the branches from above. In opposition to the usual pace of other dogs, the Newfoundland waddles with a sidelong step, and yet when he swims his motion is not distinguished by that peculiarity. Whence these exceptions? The fact is a singular feature in animal economy. The elephant is the only quadruped which has the power of bending its hind legs into a kneeling position; but this is obvious, for other animals, in lieing down bend the fore legs, and draw the hinder ones forward; but the elephant, from his vast bulk, and the length of his tusks, could not accomplish this without falling heavily, or driving his tusks into the earth, and thus a different construction was necessary to him. The camel, again, is endowed with a striking peculiarity; for, as it never lies on its side, but rests and sleeps with its knees bent under its body, and its breast upon the ground: these parts require to be particularly guarded and strengthened: it is, therefore, furnished with seven callosities, upon which it, besides, throws the weight of its body, both in assuming its attitude of repose, and in getting up. These consist of one on the breast, two on each of the fore legs, and one on each of the hind. Ignorance and atheism have sought to assert that these marks are the hereditary effects of labour, as a tight shoe will produce a corn; but although the young camel is born with them, it is not ventured to be asserted that a child is born with corns because its parent has a bunion; as well might it be said that, because shepherd's dogs are invariably deprived of their tails, their puppies are produced without them. Again, it has been advanced, in contradiction of the above, by men of less infidelity, that the original organization of the camel was adapted to the services for which it was destined, and not that these services have altered its organization. This half admission of the benevolence of God, restricting its influence to mankind, and denying its merciful provision for the care of the inferior creatures, was the reluctant confession of a mind, which never "considered the ravens, which neither sow nor reap, nor have store-house nor barn, and God feedeth them."

The feline race, without an exception, have the sidelong gait, and their quick movements consist more of a series of bounds than of any defined pace, for which the immense muscular powers of the hind legs particularly adapts them, and from the flexibility of their joints and spine they are enabled to advance in a crouching posture when drawing on to their prey.

The quadrumanous tribe, whose peculiar organization requires the food to be conveyed to the mouth by the hand, sustain with difficulty and inconvenience an upright position, but they move with facility on three legs, while employing the other to carry off their plunder. Their habits are strictly arboreal, and their home the boundless forests of the tropics, where, with surprising agility, with the most astonishing bounds and leaps, and with a gliding ease, they pass from tree to tree in uncontrolled freedom. The chamois and the numerous family of goats, inhabiting Alpine districts and inaccessible mountainous ridges, are extremely active and sure-footed, and move with ease and confidence along ledges and projecting crags which appear hardly capable of supporting them. "The former is remarkable for the prodigious extent and power of its leaps; it bounds over the chasms of the rocks; it springs from one projection to another with unerring certainty; it throws itself from a height of twenty or even thirty feet upon the smallest ledge, where there is scarcely room for the feet to plant themselves. This extraordinary power of balancing the body—of instantly finding the centre of gravity—is a peculiarity of all the goat tribe, to which the chamois is nearly allied. The ability of the eye to measure distances with such undeviating exactness is associated with this power of finding the centre of gravity." Major Smith says: "Few ravines, however walled their sides, will stop this active animal; it will either scale or leap them. I have seen it leaping down a precipice, sliding first the fore legs down the steep, while with the spurious hoofs of the hind feet it held the edge of the rock with firmness, till the centre of gravity was lowered as far as possible, then bounding forward by a jerk of the body during the descent, turn the croup under, and alight on the hind feet first, with such apparent ease that the fore feet dropped close to the hinder, and all expression of effort vanished. These descents I have witnessed more than twelve feet, and it will not hesitate to leap down twenty and even thirty feet."

The sloth moves with the utmost difficulty on the flat surface of the ground, on account of its fore legs being much longer than the hinder ones; but for the same reason, and by means of its strong hooked claws, it climbs trees with ease.

Other and almost innumerable instances might be quoted; but enough has been said to show the extraordinary diversity of the powers of locomotion; and a glance at their structure will explain the causes. Those animals which extend their arms or fore feet to seize upon objects, as the monkeys,—or to fly, as the bats,—have annexed to the upper part of the thorax, clavicles or collar bones. That of the mole, which requires great strength to mine its way through the ground, is particularly remarkable on account of its thickness, which exceeds its length. The collar bones are wanting in those animals that use their anterior extremities for progression only, and there are rudiments of them in such as hold a middle station between the two orders. The feet of mammiferous animals are mostly divided at the extremities into toes or fingers. In some, however, as in the horse, the extremity ends in a single corneous substance. The toes of a few of the quadrupeds end in broad flat nails, and of most of the others in pointed claws, over which the animal possesses a retractile power, and sheaths them, as it were, when not required for purposes of attack or defence, and thus preserves them from being blunted or injured. Sometimes the toes are connected together by a membrane: this is the case in animals which reside much in the water. Sometimes, as in the bats, the digitations of the anterior feet are greatly elongated, having their intervening space filled by a membrane which extends round the hinder legs and the tail, by means of which they are enabled to rise in the air.

In birds, the power of flight is most beautifully adjusted according to their wants and characteristics. Were the range of a bird of prey restricted by its bodily formation, its limits would soon be devastated, injury would be sustained by the absence of the smaller tribes, and the tyrant himself would perish from want. On the wide ocean the same untiring power is necessary, or the numerous sea-fowl could never skim its surface in search of food, nor reach the distant land. To the swallow, whose prey is ever on the wing, rapidity and unflagging vigour of flight are necessary, but to other insectivores, and to the granivorous birds, such attributes would be mischievous and useless; it is, therefore, only to those birds whose supply of food is precarious, or which they would soon exhaust in a limited space, that extraordinary means of flight are accorded. The wings of birds, acted upon by the most powerful muscles, bear them through the thin air, taking strong hold of that element, and pushing them on with the swiftness of an arrow through its rushing winds or its serenest repose. One great object in the structure of the wing, and the arrangement and connection of its feathers, is to render it air tight, that is, so impervious to its resistance that it takes hold of it, and propels the body forwards by the force of its blows. To give the frame additional buoyancy, the bones of birds are hollow, and much lighter than those of terrestrial animals, and means of respiration are afforded by air-vessels, that are extended through the whole body, and adhere to the under surface of the bones; thus the general diffusion of air through their bodies prevents their respiration from being stopped, or interrupted by the rapidity of their motion through a resisting medium. It is said that were it possible for a man to move with the swiftness equal to that of a swallow, the resistance of the air, as he is not provided with reservoirs similar to those of birds, would soon suffocate him. The primary quill feathers are the principal instruments of flight, and on their length its endurance and swiftness chiefly depend. The concussion of the air is sensibly felt, and even heard, as birds traverse it, the silky plumage of the owl forming the only exception; an admirable arrangement suited exactly to the bird, whose drowsy flight accords with its nocturnal habits, and whose prey would be alarmed were the rushing of its wings to disturb the dead stillness of the night. The cheerful spectacle of life which birds exhibit in the aërial regions cannot be too highly prized, and their absence would be more felt than that of the terrestrial creatures. The prophet Jeremiah seems to point at the same fact, when, in speaking of the desolation of Judah, he says "I beheld the earth, and, lo, it was without form and void; and the heavens, and they had no light. I beheld the mountains, and, lo, they trembled, and all the hills moved lightly. I beheld, and, lo, there was no man, and all the birds of the heavens were fled."

Most birds in flight either draw in or throw back the neck, so as not to overbalance themselves or to destroy the centre of gravity; but in divers, and in birds of the duck tribe, this point is placed so far back in the region of the tail, that they are compelled to find a counterpoise, and thus they protrude their necks to the fullest extent when on the wing. This same construction renders them always awkward, and sometimes even helpless, on the land, but gives them additional powers on the water, where the divers especially possess the most surprising activity and celerity of movement.

It is impossible, within the limits of this paper, to glance even at the endless variety of the locomotive powers of the insect world, differing as they do under every form, and producing the most singular contrasts; but yet each is perfect, and singularly adapted to the habits of the creature. Thus the *Geotrupes stercorarius*, or common dung beetle, can only progress in a zig-zag line, whilst the elegant dragon-fly can retrograde, or move laterally in its flight without turning, and thus more readily pursue its prey. The ephemeræ rise and fall as they sport in myriads together; some beetles, like the *Gyrinus natator* or whirl-wig, dance along the water in interminable circles, or seem to skate over its surface; the grasshopper, kangaroo-like, leaps from the ground, and the spider, as described in the book of Proverbs, "taketh hold with her hands.' With regard to the figure and motions of animalcules, Dalyell says, "one is a long slender line; another an eel or serpent; some are circular, elliptical or triangular; one is a thin flat plate; another like a number of reticulated seeds; several have a long tail, almost invisible; or their posterior part is terminated by two robust horns; one is like a funnel; another like a bell, or cannot be referred to any object familiar to our senses.

Certain animalcules can change their figure at pleasure; sometimes they are extended to immoderate length, then almost contracted to nothing; sometimes they are curved like a leech, or coiled like a snake; sometimes they are inflated, at others flaccid; some are opaque, while others are scarcely visible from their extreme transparence. No less singular is the variety of their motions; several swim with the velocity of an arrow, so that the eye can scarcely follow them; others appear to drag their body along with difficulty, and move like the leech; and others seem to exist in perpetual rest; one will revolve on its centre, or the anterior part of the head; others move by undulations, leaps, oscillations, or successive gyrations; in short, there is no kind of animal motion, or other mode of progression, that is not practised by animalcules." The wonders of the creation, if a distinction can be made, are most signal in this division, whether we look at the endless variety of its objects, the perfection of its parts, the minuteness of the whole, or the elegance of form. That life should be sustained, organs developed, principles of action implanted, and a general economy observed, in a creature less than a speck, and so minute that a magnifying power alone can prove its existence, is beyond the reach of human faculties to comprehend. Well may we conclude with the holy Psalmist, and say, "Such knowledge is too wonderful for me; it is high, I cannot attain unto it."

# INSTINCT IN DOGS.

It is to me a great source of regret that so few instances of instinct, as regards dogs, have fallen under my observation, I mean novel instances, for amidst the records of this faithful companion, it is now difficult to add a new trait. My note-book is charged with a mass of anecdotes respecting them, and to me, as having been a witness of what I have there jotted down, they possess an interest; but to the general reader that feeling would be lost, not only from his not having known the individual dog, but because similar traits have been elsewhere described. Still I feel that I can confirm, if confirmation were wanted, what has been already so ably described; and so worthy is the subject that M. Blaze, a French gentleman, who has recently written a work on dogs, has given twenty years of his life to the study, and by his frequent reference to, and mention of, the dogs of this country, he makes at once an admission of the superiority of the races we possess. I am disposed, however, to concede the pointer to the French, as better trained and under more command, and the French sportsmen assert the same thing. They prefer a dog of the *race Anglaise*, but trained and broken by their own keepers, for in districts where both the red-legged partridge and quail abound, more than ordinary discipline is required. But all pointers do not like exportation, and prefer their own quarters. A gentleman of my acquaintance gave his pointer to a French friend, who took him safely as far as Calais, and there lost it. In two days the animal arrived at his old master's residence, having doubtless made itself a passenger in one of the steam-boats returning to England.

When coursing on the heath commons in Surrey, I have often noticed a favourite greyhound take its stand on the top of the highest ground it could find, with its ears erect and its eyes gleaming with animation, watching every movement, and ready for immediate pursuit, availing itself thus of its almost only chance of seeing the hare among the high heath and fern. Other dogs watch on the outside of the copse or shaw for the same purpose. This is a high order of instinct, and sufficiently proves that the animal justly calculates on its own powers, and places itself exactly in the position where they will be available.

A black retriever I possessed, one of the almost extinct race, was endowed with more than ordinary sagacity. I directed him on one occasion to fetch me a small billet of wood, which was floating on the sea about twenty yards from the shore, as a buoy to the anchor of a small boat. He tugged and dragged, in vain of course, when suddenly he dived to remove the obstacle, and continued doing so for so long a time that I saw he was exhausted by his efforts, and not being able to make him hear me from the noise of the waves, I was forced to launch a small boat and take him in, literally to prevent his becoming a victim to his courage and staunchness.

I was on a visit some years since at the country-house of a friend near Fontainbleau, and on our return to Paris we brought up with us a useless hound, which we turned loose on the Pont Neuf. When the family rose the next morning the keeper reported the return of the dog, which had threaded the mazes of the streets, having certainly never been in Paris before, and had jogged quietly home.

A small shopkeeper of Adisham, in Kent, went out with his dog without anything being apparently the matter. Some time afterwards the dog returned, but not its master, and made a whining noise, and barked very violently, looking towards the door, and in its dumb language asking the poor woman to accompany it. This she, being alarmed, immediately did; when the faithful and sagacious animal led her to a wood, where she found her husband suspended from the branch of a tree, dead!

While on the subject of dogs the following trait of a fox, which was mentioned in the "Chester Chronicle," will not be out of place:—"The late Earl of Thanet was in the habit of removing every year with his hunters and hounds from Hothfield, near Ashford in Kent, to another seat he had in Westmoreland. A short time previous to one of these removals a fox had been run to earth near Hothfield, and, upon being dug out, he proved to be so extraordinarily large and fine a one that Lord Thanet directed it to be conveyed to Westmoreland. In the course of next season a fox was run to earth again at Hothfield, and, upon being dug out, the huntsman, whipper-in, and earth-stopper, all declared that it was the same fox which had been taken into Westmoreland, as it had an unusually large white blaze on the forehead. Lord Thanet was exceedingly energetic in his expressions of disbelief of the statement of his people, but they persisted in their assertion; and having ear-marked the fox he was again taken into Westmoreland, and turned loose in the neighbourhood of Appleby Castle. In hunting the next season at Hothfield, a fox was killed at that place, which proved to be the one in question, and which had thus found its way from Westmoreland into Kent. By what instinct or exertion of its faculties the animal was enabled to do this (the distance from one place to the other being above 320 miles), it is not easy to form an idea. Its well-known cunning would, one might suppose, be of little avail in such an emergency, except in enabling it to procure food.

The fox will sometimes turn on a single dog, and fight rather than fly. I have known two instances of this to occur — one with a retriever, and the other with a greyhound, but in each case the fox fell the victim.

# MISCELLANEA.

I was much amused once in Belgium at a curious contrivance adopted by a shepherd to extricate himself from a dilemma, and at the readiness with which his sheep obeyed his intentions. Preceding his flock, he was moving them to a fresh pasture, when his progress was stopped by a large cornfield through which there was only a narrow footpath. His knowledge of the habits of his charge made him thoroughly aware of the destruction they would commit if left to follow him at their leisure, so, after a few moments' reflection, he started off at the top of his speed, the whole flock pursuing him at a gallop, and almost in single file, without doing the slightest damage.

The white-breasted swift (*Cypselus Alpinus* of Temminc) is of so rare occurrence in this country that it is nowhere described as having been found. On August 20, 1830, a very fine specimen flew into a room of a friend at Dover and was secured. It was stronger than the common swift, and the plumage, saving the white spot on the breast, exactly resembled that of the common grey parrot (*Psittacus Erithacus*), and was charged with a fine white dust which came freely away.

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The delicate pink spots on turkey's eggs will wash off when the egg is fresh and warm. When a schoolboy in Germany, I found it impossible, from the veneration and scruples of the villagers, to rob a stork's nest for a zoological friend, who wanted a couple of eggs for his collection. The turkey's egg is of about the same size and form; therefore, rather than disappoint him, I availed myself of this knowledge to practise a mischievous hoax upon him, which I have often since repented, as he attached much importance to his acquisition.

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The extraordinary substances which have been found in the gizzards and stomachs of some birds have created much remark, and some very able papers have been written on the subject. But however useful they may be to assist the action of the gizzard in promoting digestion and to render the food fit for reception by the stomach, yet the power of retention of these heterogeneous matters in that organ is not the least surprising phenomenon. A few years since a vessel from the coast of Africa put into Dover harbour in distress, having on board, among other animals, an ostrich. This bird died while in the port, and I procured the carcass for the purpose of dissection. In the gizzard were a quantity of beads, such as are used for purposes of traffic with savages. Their polished surface and colour were uninjured in many parts, but their shape had suffered from the action of the gizzard, looking more like small pieces broken from the stem of a tobacco-pipe, worn and blunted at the edges. That they were picked up by the bird in its wild state may be fairly presumed, and to speak only by the length of the voyage they must have been for a considerable time in the gizzard, where their adventitious aid, from the nature of the food with which the bird was supplied, could not have been requisite. A wild swan, which I also dissected, had every fold and crevice of its gizzard filled with a sharp silicious sand.

Detesting cock-fighting from my heart as a most unnatural and cruel act, I yet have often got up a mock fight for the purpose of watching the passions and actions of the bird. A stuffed cock is no very dangerous antagonist, and it answers all the purposes of a live one. The eye of fire, the undaunted bearing, the unrelaxing watchfulness either for offence or defence, and the sidelong and indifferent manner in which the approach to the coming contest is made, are worthy of observation.

The effect between living combatants is precisely as if one bird were fighting with its reflection in a looking-glass, so simultaneous and coincident is each movement and feint, and so perfectly in unison with that of its antagonist in vigour and promptitude.

I have never been able to account for the following singular fact:—If a cock be taken up by the body and whirled round two or three times in the air and then be laid on its side on a pavement with its neck outstretched, and a line be drawn straight from its bill with a bit of chalk, it will lie motionless and as dead for a considerable time, if undisturbed.

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In the museum at Boulogne there is a specimen of the razor-bill (*Alca torda*), which was caught in a singular manner. An oyster attached to a stone was washed on shore by the sea, and the shell being partially open, the bird inserted its bill to extract the tempting morsel within; but the fish being still lively closed its shell, and held the razor-bill fast, and in that state they were both found and are so preserved.

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I was strolling on one of our calmest days on the pier at Herne Bay watching some porpoises which were extremely active in the vicinity of the shore, not rolling over as they are often seen at sea, but darting with impetuosity and prodigious swiftness in various directions after a shoal of fish which was within shore of them. One of a very large size dashed at last into the midst of the shoal, some of which leaped into the air while others were driven on shore, and grounded himself fairly on the beach. He lay for a few moments perfectly still, and I looked anxiously round for a rope and assistance to secure him, but by an apparently powerful effort he bent his tail forward and gave a violent spring backwards, which brought him into deeper water and enabled him to get free.

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In the herring season the gannett follows the shoals of that fish from the North Sea into the Channel, where they are not otherwise common visitants. Their voracity and daring are very great; but I never knew a greater instance than happened with the specimen in my collection. A fisherman in his little punt was fishing for whitings at a couple of miles from the shore, and was hauling over the side of the boat a fish he had just caught, when a gannett sweeping by him gorged the fish and continued his flight, drawing the line after him from the astonished fisherman. He, however, recovering his presence of mind, held on by the remainder of the line which was left to him and began to haul the bird to him, and, after considerable trouble, he succeeded in capturing it. He described the scene to me, and said that the bird offered so much resistance that he was forced to play it till he tired it.

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The razor bill, puffin, and guillemot, are often caught in mackerel nets,—thus proving, if it were necessary, that these birds dive for their prey, and at night, since the fishermen drop their nets in the tide way at evening, and haul them up at dawn. The specimens which I have had brought me by the fishermen were always found drowned, by being entangled in the meshes of the nets.

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Bewick says of the king-fisher, that it "often remains for several seconds under water before it has gained the object of its pursuit, then brings up the little fish, which it carries to the land, beats to death, and swallows." It is necessary to remark, with reference to this statement, that it is extraordinary how so close an observer of nature in general as Bewick was, should err so often in his descriptions of the habits of birds. He has made himself an authority by his two exquisite volumes on ornithology, and I venerate his memory for the many happy hours I have derived from them; but still, for the benefit of the science I love so well, I venture to make objections, and to disprove assertions, which, from personal observation, I know to be incorrect.

The king-fisher frequents the margins only of pools and streams where the water rarely exceeds the depth of a foot or eighteen inches. What the seal is to the animal kingdom—the link, namely, between the fish and the terrestrial being,—and what the bat is between the bird and the quadruped, so is the king-fisher one of the types of that gradual connection which lead us imperceptibly to the great difference existing between land and water birds.

Temminc places it between the bee-eater and the swallow, but Bewick's arrangement is preferable, as being more consonant with the habits of the bird; and he would have been more correct had he placed it after the rails, and before the grebes. Possessing all the faculties of a land bird, its form and quality of plumage yet give it the advantages of an aquatic one. It perches on the trees, and yet plunges beneath the water for its food. Its horny and elastic feather is impervious to the wet like the grebe's, to which it bears some affinity, and the leg placed far behind like the same bird's, presents no obstruction to its diving; the shortness of that member also, as well as the almost absence of the tail, are peculiarly adapted to its habits. Flying with rapidity along the stream, but not on its surface, it sees its prey; and with an immediate headlong movement it disappears, but emerges as rapidly with its victim. It falls straight as a plumb line, and if it fails in its attempt, there is no struggle, no effort made to pursue the object,—which, indeed, the formation of the bird, and its want of a propelling power would effectually prevent; for if it cannot swim on the surface of the water, it can still less move beneath it. The junction of the toes from the first joint upwards enables the bird probably to emerge more rapidly from the water, by presenting a greater surface as it makes its upward spring. The gannet, and the whole race of divers which plunge from a great height on their prey, drop straight upon it with the utmost precision. To attempt it slantwise would be to deprive the fall of its promptness and velocity, and without some peculiar formation of the eye, or some mathematical instinct, the angle of refraction would be always deceiving them, and therefore, again, it is impossible for the king-fisher to remain some seconds under water till it gains the object of its pursuit."

The king-fisher feeds like a bird of prey—it carries the captured fish to a tree, places it beneath its claws, and tears it in pieces; but I never saw it swallow its prey whole. In the autumn they often draw towards the seashore, and to some extent lose their natural shyness; for on two occasions I have seen them in the harbour at Dover, and I have met with them on the beach near Folkestone, and in the salt marshes at Rye. It is difficult to conceive the reason of this change of locality, because neither a harbour, the sea, nor a salt marsh, could afford them food. They are, I believe, mute, at least I have never heard their note, nor have I ever met with any person who has.

I cannot help noticing, before I quit the subject of this bird, another popular error with respect to it. Bewick says, "some birds are indebted to the brilliancy of their colours as a means of alluring their prey; of this the king-fisher is a remarkable instance, and deserves to be particularly noticed. This beautiful bird has been observed, in some sequestered place near the edge of a rivulet, exposing the vivid colours of its breast to the full rays of the sun, and fluttering with expanded wings over the smooth surface of the water; the fish, attracted by the brightness and splendour of the appearance, are detained, whilst the wily bird darts down upon them with unerring aim. We do not say that the mode of taking fish by torchlight has been derived from this practised by the king-fisher, but every one must be struck by the similarity of the means." Now, in the first place, I contend that this hovering or "fluttering" is not at all habitual to the bird, and next that it is impossible for a bird in that attitude to "expose the vivid colours of its breast to the full rays of the sun," for according to established principles the rays of the sun fall on an object, and not beneath it. Besides this difficulty, what resources would the bird have during cloudy weather? and why should the fish be detained by the reflection or shadow of a king-fisher, when every other moving shadow alarms them? The idea and description are highly poetical, but they cannot be maintained. We have in this country but one bird rivalling in beauty the splendid plumage of the tropics, and it has unnatural, if not impossible, attributes assigned to it, while, by a singular freak of nature, many of the tropical birds of the *same* family are dull and sombre in their plumage, and consequently must have recourse to other means of maintaining life, than dazzling the eyes of the poor fish with their splendour.

It is singular that superstitious ideas of the same character should be prevalent in different countries —that the same inference and deduction should be drawn from the same false data, and the same sayings become current. It is a subject for the consideration of a physiologist. It is a common remark, as regards some birds, that they bring good luck to the houses on which they build. Swallows and storks belong to this category, and they build, especially the latter, on such houses as seem to offer the greatest security to the nest, from the state in which they are kept; and because industrious and provident people take care of their houses and property, and generally prosper in their worldly affairs, it is easy to establish a paralogism, and to argue from the effect rather than the cause. The luck is to the nest, not to the house.

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The Camberwell beauty (*Vanessa Antiope*) is very common in Russia. It appears twice in the year—namely, in May and August. I was engaged in a shooting party at some distance from St. Petersburg, in the early part of the former month; when, although the sun had considerable power, yet the pools and pieces of water were still frozen, and the woodsides, with a northern aspect, were still deep with snow, while the southern sides were clear, and vegetation had commenced—presenting a singular contrast of winter and spring. The country was wild and desolate, but broken by extensive birch woods; and among these, the Vanessa Antiope was flying in great numbers, several being on the wing at the same time within a few yards of each other. I had no net, and consequently was unable to take a specimen; but I could see distinctly that they were similar to those found on other parts of the continent, having a more yellow border than those of this country. Knowing how uncertain they are in their appearance in England, I was anxious to learn whether the same circumstances had been noticed in that district; but there were hardly any inhabitants to be found, and they were too ignorant to have an idea on the subject.

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The scarcity of many of the varieties of the sphingidæ may be attributed in some degree to the great destruction which attends them in their pupal state. Burying themselves beneath the ground, to undergo that change in their existence before they emerge in their perfect state, they fall victims to the prejudice and ignorance of the working-classes, who consider them as "maggots." Knowing of the existence of some of the Sphinx atropos in a particular potato field, from the larvæ having been seen in it, I particularly enjoined the labourers, when digging up the crop, to save for me "the large brown maggots." They collected some six or eight, and assured me that they had often found them abundantly, and crushed them.

In the autumn of 1843 (September) I was looking on at a man cutting down the grass on the borders of the Basingstoke canal, and before I was aware of it, he trod under foot a beautiful larva of the Sphinx elpenor, which he declared and believed to be a slow worm, to which indeed it bears a slight resemblance. By watching and offering him a small reward, I succeeded in obtaining two other specimens, probably the only remaining ones, as the man told me he had killed several others. The privet moth is the most common of the sphingidæ, because it is less exposed to destruction. It feeds in its caterpillar state on the leaves of the shrub from which it takes its name; and goes beneath the ground at or near the root of the shrub, which ground being rarely or never disturbed, the insect passes through its several transformations in security. They are also less liable to be trodden under foot as larvæ, like others of the family which feed on low and graminous plants.

In fir woods, where the surface of the ground is clear and divested of underwood, a great quantity of pupæ of some of the rarest lepidopteræ, besides coleopterous insects in a state of hybernation, may be found in the winter by peeling up the moss which covers the ground. I pursued this system with great success, in the large fir woods in the neighbourhood of Frankfort, collecting thus many specimens which I had never before met with, and particularly some of the rarer cerambycidæ and the Sphinx pinastri. The pupæ of all the lepidoptera which I found came forth indiscriminately throughout the winter, from the great heat of the rooms.

The readiest way to ascertain the presence of a caterpillar (particularly of sphingidæ) on any shrub or plant, is to look out for their castings on the ground, and the larvæ may then be easily detected.

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The glow-worm (*Lampyris noctiluca*) is found, as is well known, in the months of June and July, and I have nowhere seen it mentioned as having been noticed at any other period; but in the beginning (the 4th) of October, 1832, I was driving in the evening between the towns of Tenterden and Ashford, and saw very great quantities of them. The circumstance was so singular, and at variance with their established season of appearance, that I collected several of them to place the matter beyond all doubt. In this case these insects must have been the produce of a second brood.

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The system of communication, by means of carrier pigeons, between London and Paris, is carried on to a very considerable extent and at a great cost. There are several perfect establishments kept up by parties interested in the quick transmission of intelligence, at the ports of Dover and Calais, and at regular distances on the roads of the two countries, whence the birds are exchanged in regular order as they return with their little billet. The interruption occasioned by the hours of night is made up by a man on horseback, who again at daylight, on arriving at a pigeon station, transfers his dispatch to the keeper, who has his bird in readiness. The distance by day is accomplished in less than eight hours. It has been found that hawks have proved themselves dangerous enemies even to these quick-flighted birds, and a premium of half-a-crown is paid for every hawk's head produced. The pay of a keeper is 50*l.* a year ; and when this is added to the cost of food and the expense of sending the pigeons on from station to station to be ready for their flight home, it will appear that the service is attended with considerable outlay. The duty of training young birds, and the management of the old ones, in feeding them at proper times, and in keeping them in the dark till they are thrown up, is very responsible and almost unceasing. A good bird is not supposed to last more than two years.

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The green tree frog (*Rana arborea*) is a very interesting companion in a room. I have been much in the habit of keeping them, and the last I had lived upwards of six years with me. I kept it in a large glass vase, covered at the top with a piece of gauze, and with sufficient water in it to support a sprig of the Camelia japonica, the broad smooth leaf of which it infinitely preferred as a seat to that of any other plant. It had learned to know those who fed it, and at their presence it showed a manifest liveliness, and would approach the top of the glass to receive its accustomed fly. In the summer time it was often allowed to hop about the table to catch flies for itself, and if put on the finger and held opposite, but at a little distance from, a fly on the window, it would spring to it and seize it with the most unerring aim, adhering at the same time to the glass. As a store against the winter, dead flies were collected for it, which when moistened with warm water, it took freely from the fingers. Towards evening it generally began its croak, inflating its throat to half the size of its body, and uttering a sound disproportionately loud and deep for so small a creature. It is remarkably cleanly, and there is nothing viscid or slimy in its feel when brought in contact with the skin; and with its beautiful pale green body, full black eye, and gentle manner, it is a pleasing little animal.

They could be easily introduced into this country as an addition to our fauna.

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The blue-throated warbler (*Motacilla suecica*) is not mentioned as a British bird, nor as an occasional visitant. A specimen was shot at Margate, in September 1842, and is now in the museum of that town. They are very common in Russia and Sweden.

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The night-jar was particularly abundant in a district of Surrey where I was residing during the summer of 1843. I often saw as many as six on the wing at the same time, sporting among the fir plantations which abounded on the spot. The jarring or purring sound emitted by them in the early evening is continuous until they take their flight, when they call to each other with a kind of plaintive note or whistle, striking their wings so strongly together over their backs that the concussion is distinctly audible. They fly with great velocity, and quite noiselessly, owing to the silky owl-like structure of their feathers. The moment they capture their prey is very discernible by the tumble or somerset they make, like some kind of pigeons, at the time. On very fine and mild evenings they will soar to a great height, hawking and wheeling about like swifts in very graceful circles. The opinion entertained by White, that the serrated middle claw is used for the purpose of seizing and conveying food to the mouth is evidently a misconception, for the prey is too minute and fragile to be caught by so coarse and stout an organ; and besides, the wide gape of the mouth, with its fence of bristles, seems to be expressly formed, and is most admirably calculated, for the purpose assigned to the foot by White; and in the economy of Nature no animal is made to use an extraneous process to procure food, when the most simple and perfect contrivance is supplied to it. The serrated claw in question has doubtless its purpose, but like the long spur of the lark, and the foot of the kingfisher, it has not yet been discovered. It might, with equal plausibility, be asserted to be used to cleanse the comb-like process of the bill. Mr. Jesse states, with respect to the heel or spur of the lark, that he has ascertained beyond a doubt that it enables the bird to remove its eggs to a place of security in the event of danger, and he exemplifies it by describing in what manner the egg is held or secured by the foot. I cannot doubt what so accurate an observer of nature, as Mr. Jesse is, affirms he has placed "beyond a doubt;" but I am more disposed to look back to the early days of the creation, when man was not spread over the surface of the world, and the lark could rear its young without molestation, and hence had no occasion for its spur as a means of transporting its eggs; not that I deny that the fear of danger, and the sense of insecurity, will induce most animals to resort to expedients, which appear to be so far removed from instinct, as to resemble strong reasoning powers. Other birds, and they are numerous, which build on the ground, and are provided with no means of protecting their eggs from destruction, possess as powerful an affection for their young, and even suffer themselves to be cut to pieces by mowers rather than move, and possess no means of evading their doom, and removing their eggs from the coming danger. Let us instance the partridge, which often experiences this fate while sitting on her eggs; but after they are hatched, her cunning to protect her brood is of the highest order of instinct. Can it be possible that the lark should foresee its danger from the mower? I humbly submit the negative.

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Memory and Revenge.—A striking instance in proof of the existence of these faculties in animals occurred some time since at the seat of a noble lord in Surrey. In the park are two large pieces of water, divided by a small isthmus, which widens considerably at one extremity, and at the time in question a pair of swans were the occupants. A doe and her fawn, belonging to a herd of deer in the park, coming down to one of the pieces of water to drink, were immediately set upon by the swans, and the fawn, by their joint efforts, was got into deep water and drowned. After a considerable interval of time, when the swans were one day on the wide part of the isthmus, and thus separated from their element, and at a disadvantage, a rush was made upon them by a number of the deer, which trod under foot and utterly destroyed one of them. The bereaved doe must have had some means of communicating her loss to the other deer, and of urging them to help her in her revenge; and the most remarkable part of the transaction is, that the deer must have had a kind of consciousness of the fitness of the moment, when the swans were to a great extent defenceless, or at least deprived of their greatest advantages, and had no means of effecting their retreat to the water.

The annals of animals abound in such and similar instances. The treasured revenge of the elephant, which was pricked in the proboscis by the tailor; of the dog, which resented the murder of its master on his assassin, are too well known to require comment, and are conclusive proofs that animals are endowed with feelings and passions, which happily are not brought gratuitously into action, but are the effect rather of impulses called forth by extraordinary occasions. Without positively admitting this fact, we are yet always acting upon it, and shaping our conduct accordingly. Our dog is not playful to-day, because he is in bad humour,—the keeper dare not enter into the lion's den, because the noble beast is sullen and morose, but left to themselves they resume their previous subjection, and man reasserts his dominion.

Sudden and decided conduct, and the absence of all fear, has its effect on, and intimidates, the most ferocious of beasts. Carter, the celebrated lion king, possessed perhaps as much daring and self-possession as has ever been known. A full-grown and powerful Bengal tiger was landed out of an Indiaman for him, and was to be trained for his theatrical exhibitions. Carter expressed no concern at the task, nor anticipated any difficulty; and when he judged the fitting moment to have arrived, he caused the door of the cage to be opened, and suddenly stood in the presence of the astonished beast, armed merely with a slight horsewhip. Cowed by the effrontery and stern glance of the man, the tiger crouched into the most distant corner of its cage terror stricken. A blow with the whip and an indication of the finger, sent the now submissive beast to another corner, and thus it was kept on the move from spot to spot, till Carter, retiring from the cage, declared its entire subjugation. The feats of this extraordinary man on the stage are well known, but he would often amuse himself in private by matching his strength against that of his animals. I have seen him, for instance, release a puma from its cage, and seizing the beast by its tail attempt to drag it along; indeed I do not believe he knew what fear was. Frequently on the stage he has been severely bitten and mauled, without exhibiting the slightest uneasiness, or even fear of the beast, which had converted its feigned ferocity into an actual attack. Altogether his command over his animals was an astonishing exhibition, and proved forcibly how completely the majesty and dauntless daring of man can effect dominion.

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The sturgeon is not very common in the Neva, but specimens are occasionally caught, and some of large size, in the seines used at the salmon fisheries. If they are not bought on the spot and cut up for the sake of the caviare, a hole is made in the cartilage of the nose, through which a rope is passed, and the end attached to the stern of one of the floating fish stalls, thus enabling the fish to swim about till its doom is settled. I have often hauled in the rope to have a close inspection of the fish, which, from its great strength and resistance, is no easy task.

Hideous and alligator-like in its appearance, it is one of the most timid fish known.

Caviare is held most justly in the highest estimation as an exquisite delicacy and relish, but, excepting on the occasion of a local fish being caught, it is not to be had till late in the season in its fresh state: the pressed or prepared caviare can be had at all times, but as it retains little of its original flavour, it is used only by the poorer classes. Its appearance is dark and untempting, whereas the fresh, with its delicate amber tint in a kind of semi-fluid state, is a positive luxury, but it is not available to the gastronomes of the capital till late in the autumn when it arrives from the Caspian sea. The Russians use it before dinner as a whet, flavoured with the slightest soupçon of onion, on a foundation of bread and butter, and crowned with a small glass of liqueur.

Salmon are caught in very considerable quantities in the Neva by seines, which are worked without intermission from the earliest hour in the morning till late at evening, and there are three considerable establishments alone in the most crowded part of the river, in the centre as it were of the city. Three seines are in operation at the same time—while one is being landed, a second is being hauled home, and a third is being shot. The rapidity of the current renders this economy of time easy, for as it is necessary to row high up the stream to shoot the seines, they each follow in a regular succession as they float down; and the tackle being made fast to the respective capsterns, they are hauled in without the slightest confusion or entanglement.

There is a curious custom observed at these fisheries. An elevated platform or look-out house, commanding the spot, is built for the accommodation of spectators, who speculate on and purchase the chance of the haul, the price varying from three to ten shillings, according to the state of the weather and abundance of fish. By this rule the purchaser is entitled to all that comes up, and on one occasion a singular and unpleasant adventure arose from the practice. A dead body was dragged up and the fishermen insisted on the party who had bought the haul becoming responsible for it, or in other words that the explanation of the matter to the police and the interment should devolve on him, as the contents of the net by purchase belonged to him. This doctrine not being palatable to him, he fairly took to his heels, and a hue and cry was made after him, but unsuccessfully, and thus the obligation remained with the fishermen. A similar circumstance, but without purchase, occurred at another spot. A dead body was fished up, but no person entitled to interfere being present, it was taken lower down the stream and again committed to the water, but by some under eddy it again worked up the current, and was again hauled in, to the consternation of the fishermen, whose superstition was so thoroughly awakened that they resolutely refused to fish any more that day.

Smelts—the real cucumber smelts—are in such immense abundance in the Neva in the month of May, that they are caught by thousands in the seines, and the air for some distance around is impregnated with the smell peculiar to them. I have seen them in such vast quantities in the nets, that the fishermen were compelled to ladle them out with purse nets before they could land the seine; and strange as it is, the fish are hardly saleable, owing to a superstitious idea entertained by the Russians, that they feed at that season on some aquatic herb, which causes the ague to those who eat them.

The cydak, pronounced sudak, the Perca leucoperca of the American lakes, is common in the Ladoga lake, where it attains to a large size, and is brought down to St. Petersburg in great numbers. It is extremely delicate and well-flavoured, and could readily be introduced into our own Scotch and English lakes, and other large pieces of water, both as an object of sport to the disciples of Isaac Walton, and as an additional delicacy for the table.

Lampreys are caught in some quantities, and the fishery is continued through the depth of winter by means of wooden cones or pots, made on the principle of an eel pot, which are let down through holes cut in the ice.

Seals ascend the river to some distance, but are not of frequent occurrence, excepting in the Baltic. The sterlet, a variety of the sturgeon, is in great abundance in the Volga, but it is seldom met with in the Neva. It is so highly prized as a delicacy that it commands the most extravagant prices; the flesh is hard and gelatinous, and when converted into soup with a mixture of champagne, it is considered a ne plus ultra in cookery, and of course is only met with at the tables of the rich and great.

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There can be no new argument necessary to prove the insensibility of fish to pain. I was fishing one day at sea in a small boat with some friends, when one of them pulled up a large whiting, which suddenly broke away, carrying his only hook and a portion of the line with it. Almost instantaneously I had a bite, and hauled in the very same fish with the former hook in its jaw, and thus singularly enough enabled the other party to proceed with his sport. The escape and subsequent capture did not occupy more than a few seconds of time.

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Stockholm is supplied with fish brought in by fishermen living on the islands in the Fjords, and as the water so high up the Baltic is free from salt, they are entirely fresh water fish. To preserve them during the length of the voyage, for they are all brought up in boats, and because the Swedes, like the Russians, will not buy dead fish, a well is constructed in the stern of the boats in which the fish are kept. This gives their craft a very odd appearance, bringing it down so low in the stern that it is level with the water in that part, while the bow is unduly elevated above its proper trim. While the little vessel is under weigh, there is of course a constant motion of the water in the well, and the fish continue lively; but when at anchor, to prevent stagnation, a large stone slung from the peak of the yard-arm is swung to and fro by a lad, which thus keeps up a constant rocking motion.

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As a lad in Germany, I and some of my companions hit upon a singular and novel plan of fishing. The Nieda, a small stream tributary to the Maine, and taking its rise in the Taunus mountains, generally overflows the country to a vast extent after the heavy autumnal rains. The rapid succession of frost quickly changes these inundations into a most glorious expanse of pure, green, and transparent ice. We became soon aware of the large quantities of fish moving beneath the surface, and as the water was not deep, the stubble of the autumn crops and long grass offered occasional resistance to their speed. Provided with a little hatchet and an iron shod stick we fairly skated them down, when a hole cut through the ice with the hatchet, and a blow on the head with the stick would put us in possession of our prey. We could catch thus many pounds weight of pike in a day.

During the winter of 1841, which I spent in Russia, I amused myself by keeping a variety of the common birds of the country in cages, and by taming them. Bullfinches, several varieties of the titmouse and the pine grosbeak were the most prominent, and I succeeded most effectually with them. The latter I sent to England in the spring, and presented to the Zoological Society in the Regent's Park. I had accustomed them to be a great deal at liberty in the room, and to perch on my extended finger to take a piece of biscuit or sugar. After some months I went to pay them a visit, and protruding my fingers through the wires of the cage, I held out a piece of their favourite food, when to my gratification they recognised the old signal, and perched fearlessly on my hand.

A little coal titmouse, which I also had, carried its familiarity even further, for it refused to be a prisoner. The wires of the cage were not sufficiently close to confine so small a bird; it slipped in and out at its pleasure, never mistaking its cage, and rarely going in but to feed; spending its time in the most amusing gambols, prying into every place and thing, and rummaging about in my wife's work-box, and roosting always in a corner of the cornice of the room. On leaving the country I gave it to a lady, but notwithstanding all her care and anxiety to preserve it, by allowing it as much as possible the full exercise of its former habits, it began to pine, and survived only three days.

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Since the repeal of the game laws, and the now legal sale of game, poaching, to say nothing of the clandestine dealings carried on by gamekeepers, has much increased. The facility with which a sale can be effected, and the difficulty of detection, embolden the poacher, and he is less careful in avoiding suspicion, and affects no scruples in displaying the tricks and cunning of his craft. I am fond of coursing, and although there are many hares in that district of Surrey in which I reside, yet we are so infested with poachers that there would soon be a scarcity; and I have therefore made terms with these men to give them a fee whenever they can show me a hare sitting. The price is too tempting for them, as they could not sell the poached animal for so large a sum, and they therefore invariably give me due notice; and besides, as love of sport is the foundation of poaching, they are much gratified at being present at the course. On one occasion, after a run, they found a very young leveret in its form, which one of them seized, to make use of as a means of catching the old hare. By pinching the young animal sharply in the throat, he succeeded in making it utter the most piercing cries, such as would occur were it attacked by a weasel. The old one came up from its concealment and would doubtless have afforded a capital run had I permitted it. How much knowledge of nature there was in this manœuvre, and how closely the habits of the animal must have been watched thus overcome its natural timidity. By attending closely to the characters of animals many singular traits are brought to light, and many remarkable proofs of instinct discovered. A friend of mine has always contended that a pig is a sagacious beast, and he instances it by the following fact. He describes himself as having been lost in a very extensive park, the undulating and wooded character of which prevented him from catching any glimpse of the house, or of any point of exit, and after riding about till he became even more bewildered, he at last disturbed a pig in a heap of fern. That it was turned out to feed on the acorns and beech-nuts, then thick on the ground, was evident; and it struck him that by riding at it, it would run homewards for protection. It galloped off in a straight line, and, after the run of a mile, brought him to one of the keeper's lodges, which was hidden by trees and ivy.

The swine herds in Germany, who collect the whole swine of their village in the autumn by sound of horn, to take them into the fields to root about, have no trouble with their charge. They run to him at the uncouth sound of his horn, and at night, when he brings them back, they return straight to their respective quarters. I think that Sir Francis Head, in his Bubbles of the Brunnen, describes this scene.

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Among the various animals which I have amused myself by keeping, I had at one time two monkeys, one Asiatic, and the other African. Their affection for each other was unbounded, and they were constantly hugging and embracing each other. They were extremely fond of wine, and the sight of a wineglass drove them frantic with delight. A stupid servant gave one of them a whole glass of brandy, which completely intoxicated it, and brought on apoplexy, of which it died. During its illness the attentions of its companion were most affecting; as if knowing the seat of pain, it sat holding the forehead with its hand, and attempting to induce it to eat; and when at length it died, it held the body so powerfully that it required force to part it. It never recovered itself, but fairly pined away.

I had pointed out to me a remarkable instance of the sagacity of a horse at the Camden Town station of the Birmingham railroad. As the goods carriages arrive, the break is naturally put down to stop them, and it may occasionally happen that it is omitted to be raised when it is necessary to remove the carriage off the line, which is done by horses. The animal in question, which was constantly employed in this service, would invariably turn its head round to satisfy itself that the breaks were off before he would move, and refused to do so if by accident they were down. It requires a powerful effort in a horse to start eight or ten waggons, though the draft is afterwards easy; and it is supposed that he had on some occasions exerted his strength in vain, and became aware of the impediment. Familiar and more extraordinary instances of the sagacity of the elephant are on record, and I see no reason to doubt this of the horse.

How often does it occur on field days and parades of cavalry that a soldier is thrown, or his horse escapes from him, and how invariably does the horse gallop back to the ranks and resume its position in them. The effect of discipline and habit may have much to do with this; but still there is an equal display of instinct. This to as great an extent occurs in the field of battle; but then of course without regard to the corps, as the animal will attach itself to the first squadron it can meet. In the hunting field a horse will often continue the chase without a rider.

The climate of the north of Russia is too cold for asses. Hardened, neglected, brutally kept, and often more brutally worked, and picking up a precarious subsistence by road sides, as we too frequently see them, what a contrast does it present to find a beast carefully housed from the cold, and kept as a rare animal; and then to turn to the starved and humble victim of the tyranny of every blackguard urchin. Considering the value of this animal to the poorer classes in this country, it would surely be worth the attention of philanthropists, and the promoters of usefulness and improvement among our agricultural labourers, to encourage an amelioration in the breed. The constant and rapid communication with Egypt would render such a measure most easy of execution.

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The summer of 1834 was peculiarly dry, and indeed so little rain fell, that in many places the springs of water entirely failed, the wells were dried up, and the cattle suffered severely from the general drought. A singular and unaccountable phenomenon occurred with regard to the celebrated well within the walls of Dover Castle at this time. This well is cut through the solid chalk cliff to the depth of 400 feet, and its waters are drawn up by great manual exertion, into a large tank, for the supply of the garrison. During the extreme drought prevailing elsewhere, the water in the shaft rose sixteen feet above its usual level, and then continued to subside gradually in proportion as the springs and wells in the vicinity returned to their former limits in April, 1835. In the course of some repairs which were being made to the castle walls in the neighbourhood of the prison, a singular vessel was found by the workmen in an excavation they had formed under the foundations. No period has been assigned to it, nor is it clear for what use it was employed. It is of a sandy stone, not unlike that brought from Caen; but has become hard and rough on the surface. It bears much the form of the mortars used in the present day, and it may probably have been used for the purpose of pounding corn, excepting that a rough lip, or notch cut across the rim, implies that it was used for liquids. A second vessel of the same description has more recently been found in pulling down a fragment of the ruin of St. Martin's Church.

From the Roman camp at Folkestone to Richborough Castle, near Sandwich, there is perhaps no district more rich in Roman remains. At Sibert's-would, coin, fragments of spurs, and buckles are often found, and at Water's-end, on a small tumulus being accidentally opened, an entire warrior was discovered, the helmet being in a peculiarly perfect state. Vases are frequently brought to light, but hardly any of these interesting remains find their legitimate destination. The Museum at Dover, which should be the depot for all matters of local interest and history, is seldom enriched by contributions of this nature. The inroads of the sea at the Reculvers have brought to light some highly curious and valuable specimens of Roman glass urns and vases, in a high state of preservation, which are now in the Canterbury Museum,—together with a very good collection of bronzes found in the same locality. Further along the coast there is a rich field for the geologist. In the sands at Herne Bay at low water, great quantities of the fossil bones of the elephant, stag, ox, and other animals, are found, and the sea banks of the Isle of Sheppy abound in fossil specimens of the tropical fruits. The great distinctions which exists as to public institutions, between the people of this country and those of the opposite shore is much to be lamented. Here the greatest apathy prevails, and support, if at all, is tardily rendered; there a generous emulation exists, and their provincial museums manifest at once the interest and pride felt in their welfare. And yet how much more may be worked out in this country; and what superior advantages does it possess? The external resources are unrivalled, and its concealed wealth is unknown, excepting to a privileged few. Offence of some kind has been given to the traveller Bullock, and his unrivalled collection, the fruit of his perseverance and toil under the burning African sun, is closed to the public, and the cases containing it have not yet been unpacked. The cellars and closets of the British Museum abound in duplicate specimens in every branch of natural history and science, and their advantages denied to the public. If the trustees have not the power, they have the means of obtaining it, and of conferring a vast benefit on the provincial towns of the kingdom. All provincial museums established on a firm basis, public in their constitution, and governed by trustees, should be allowed to have a claim on these vast stores—these accumulated duplicates ; for, although from their nature, and the mode by which they were acquired, they cannot perhaps be alienated, and must remain national property, there is nothing to prevent their being deposited on trust, and under proper security, within the walls of the county institutions. How much wider would the sphere of knowledge be spread, how greatly would the public taste be improved, and how much might be done towards softening the spirit of destruction and violence, and exciting higher and kindlier feelings.

The exchange of specimens with the great national museum would be mutually advantageous, and a spirit would be created to enrich it with new and valuable additions. In ornithology alone, a most important benefit might be reaped by it, for there is not a provincial museum but would blush to see its cases encumbered with such a disgraceful set of British birds as figure for the most part in the national collection. No outlay, no expense, need be incurred ; and yet the fostering hand of the Government might bestow an incalculable benefit on society. If it is worth the attention of a government to form collections, and to enrich the museum as a cradle for the sciences, but by which only the residents in the metropolis can be benefited, it is equally their duty to give their utmost assistance to those who so laudably and disinterestedly bestir themselves in the country towns.

The Dover museum is peculiarly rich in its collection of British birds, and stands unrivalled as regards the condition and excellence of the specimens, and their setting up. Much pains have been bestowed upon it by its indefatigable curator, to whose efforts its prosperity is mainly to be attributed.

Kent, particularly that part of the county bordering on the sea-coast, is rich in ornithology. The following is a list of the more rare birds which have fallen under my notice in that district :—

| | *Where shot.* | *In whose possession.* |
|---|---|---|
| Falco ossifragus | Dover & Canterbury | Dover Museum. |
| ,, haliaëtus | Minster | R. Tomson, Esq., Ramsgate. |
| ,, peregrinus | Shakespeare's Cliff frequent | Dover Museum. |
| ,, lagopus | Wingham | W. O. Hammond, Esq. |
| ,, apivorus | Waldershare | Dover Museum. |
| ,, subbuteo | do. | do. |

| | *Where shot.* | *In whose possession.* |
|---|---|---|
| Falco æsalon | River | Dover Museum. |
| Strix nyctea, old male | Sittingbourne | |
| .. passerina | Maidstone | do. |
| .. scops | do. | do. |
| Corvus graculus | Dover | do. |
| Ampelis garrulus | do. | do. |
| Oriolus galbula, male and female | Betshanger | |
| Turdus torquatus | Dover | do. |
| Upupa epops | do. | do. |
| Loxia curvirostra | do. | do. |
| .. pityopsittacus | do. | do. |
| .. caccothraustes | do. | do. |
| Emberiza nivalis | do. | do. |
| Cypselus alpinus | do. | do. |
| Otis tetrax | Canterbury | Canterbury Museum. |
| Charadrius himantopus | Faversham | do. |
| .. cantianus | Lydd, numerous | Dover Museum. |
| Ardea ciconia | Sittingbourne | do. |
| Platalea leucorodia | Lydd | do. |
| Scolopax lapponica, male and female | do. | do. |
| .. glottis | do. | do. |
| .. calidris | do. | do. |
| Tringa ochropus | do. | do. |
| Recurvirostra avocetta | Feversham | Lady Harris |
| Sturnus cinclus | Dover | Dover Museum. |
| Phalaropus lobatus | Canterbury | Canterbury do. |
| Colymbus arcticus | Ashford | Dover Museum. |
| Terna cantiaca | Lydd | do. |
| Sterna Anglica | do. | do. |
| Larus Glaucus | Dover | do. |

| | *Where shot.* | *In whose possession.* |
|---|---|---|
| Procellaria pelagica | Dover, found in the streets after a storm | Dover Museum. |
| Anus cygnus | do. caught alive in the harbour | do. |
| .. erythropus | Sittingbourne | do. |
| .. marila | Dover | do. |
| Alca alle | Ramsgate | R. Tomson, Esq., Ramsgate. |

As a field for the entomologist, the same district has been long known to be peculiarly favourable, and in ichthyology much might be done, but for the ignorance and impositions of the fishermen. A rare fish is looked upon as a treasure by them, and is exhibited as long as its presence is endurable, when their exorbitant demands not being complied with, they wilfully destroy it. Thus an enormous specimen of the *Mola peregrina*, or sun fish, was lost, and a very large fishing frog (*lophius piscatorius*) with difficulty secured.

The preparation of fish for a collection is little understood, and the hitherto considered impossibility of keeping their colours has left them to be preserved, as of old, in spirits. There is, however, a method by which their colours may be preserved to a considerable extent, and a smooth and natural form be given to the fish. In skinning it, the incision should be made either on the side or along the stomach, according to the description of the fish, extracting the whole of the body, and leaving only the skull, from which the gills and all flesh should be carefully removed, and the interstices filled with cotton steeped in arsenical soap. A wooden model from exact admeasurement having been previously prepared, the skin, well primed with the arsenical soap, is carefully stretched over it, and the edges, when brought together glued down. The finest and best varnish must then be lightly brushed over the specimen, and be renewed from time to time till the skin has become hard and dry, and thus the colours will become permanently fixed. In all cabinets where there may be the least tendency to damp, quick-lime placed in saucers will be found a complete absorbent.

Little interest is felt in the study or collecting of reptiles, and principally, I believe, from the supposed difficulty or impossibility of preserving them. The curators of the museums of Boulogne and Douai have brought the art to perfection, and instead of rows of glass bottles, in which specimens can never be fairly seen, they present them perfect in form and colour, and in the most natural and lively attitudes. The specimen, if a snake, should be washed clean in warm water, to remove all traces of the alcohol, and a small incision, equal in length to the circumference of the thickest part of the body be made in the neck, through which the body is drawn by means of a string fastened to the upper part of it when divided at its junction with the head. All flesh being removed, and the skin well rubbed with the arsenical soap, it is changed from its inverted position by a string, which has previously been fastened to the extremity of the tail. Hot sand poured into the incision by means of a quill or funnel, according to the size of the animal, and rammed down equally with a wire rod, fills the skin to its proper limits ; and a board having been cut out in the form or attitude intended to be represented, the animal is glued on to it, and a beautiful specimen is produced, perfect in colour, and natural in its figure.

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The double snipe (*Scolopax major*), commonly called the great snipe,—correctly described by Latham, but doubted by Bewick, who says, "it is not clearly ascertained whether this be a distinct species of snipe, or whether it acquires its bulk and change of plumage from age, and its solitary habits from ceasing to breed,"—is most common and abundant in the neighbourhood of St. Petersburg, in the month of August, where it is not at all an unusual thing for a sportsman to kill several couple in a very short time. They are highly prized as a delicacy, and being at that time in full condition, they often, like the quail, burst from sheer fat when they fall. There is, however, even there a mystery connected with them, as they are found at no other time; and it is not at all known whether they are there emigrating, or to what point they are directing themselves; and their stay is very brief. Their extreme rarity in this country may have gained for them the term "solitary," but that is certainly not applicable to them in the North, and Temminck, whose authority is beyond dispute, says, that "they inhabit the vast marshes and swamps of the North: are regular in their migration to some countries, but only accidentally so to others: not frequent in Holland, and rare in France and in the South." Bewick's remark respecting its bulk and change of plumage from age, and its solitary habits from ceasing to breed, is not admissible, because the same doctrine would equally apply to every other species of bird, and as this is notoriously not the case, it is rather a vague theory on which to establish an exception in this instance.

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The stormy petrel is rarely or ever met with at sea, in the channel, or in the west of the German Ocean; and indeed it is seldom that they are seen in the neighbourhood of land, yet there are numerous instances of their having been found inland as solitary birds. Bewick recites several cases, and the only specimen I could ever obtain was picked up alive in the streets of Dover in a most exhausted state during a severe gale. Found in the widest oceans, far from shelter, and exposed to every storm, they yet live through them, and indeed face them, while all other water birds seek safety in flight. Driven by the fury of the tempest, perhaps, like a ship, they only require good sea room to keep their element; but if, in their inability to resist its violence, they be borne towards a lea-shore, the same wind would naturally carry them inland, where the absence of food, and exhaustion from their contention with the elements, would soon cause them to fall and perish. From their being found singly in this state, when they are known always to fly in flocks, it is probable that only weak birds thus perish.

Swallows frequent pasture lands in dull cold weather, hawking around the cattle for the sake of the flies they disturb while feeding. What is this but instinct?

Birds are subject to many varieties in their plumage, and it is singular that these eccentricities of nature should not be found in a whole brood or nest, but should be confined only to one or two individuals of it; and that it should also occur more frequently with some species than others. A white or pied pheasant, for instance, is not uncommon, nor is a white rook absolutely so; and I have frequently in Russia met with the male black grouse pied, and the female spotted with white. A male of this species was presented to me with black and white feathers alternating, and on the latter the representation of the curved feathers of the tail was most accurately marked in black.

The following varieties have fallen beneath my notice :—

| | |
|---|---|
| Sparrow<br>Partridge<br>Woodcock | Cream coloured. |
| Rook<br>Starling<br>Sparrow<br>Lark<br>Swallow | White |

and robin with the breast white.

It would appear from this small catalogue that it is almost the absence of all colour, rather than a change; and, as before stated, individuals only are affected by it, which would lead to the supposition that some defect in the egg was the cause. It can have nothing to do with the external surface, for that retains its colour under all circumstances, even after the process of incubation, and thus the matter which influences and decides the colour of the bird must be within the egg; and its absence would naturally affect the plumage of the future bird. The pea hen and hen pheasant not unfrequently assume the male plumage as they grow old and have ceased breeding; but it is a singular phenomenon and one which baffles all inquiry.

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Stags, when hunted, almost invariably take the water, crossing it repeatedly to break the scent, and often, when exhausted, seeking refuge in the centre of a pond. The instinct of animals, when pursued, cannot be exceeded by the most perfect reason of man. The stag, besides taking to the water, will attempt to rejoin a herd, and thus baffle the scent; the fox runs down the wind, among its other wiles; and the hare takes refuge among a flock of sheep, or drives another hare from its seat, and allows the chase to pass by her. Stags will venture any leap to escape; but as opportunities of any magnitude do not often present themselves, the fact has not been much noticed. The stag, Percy, in front of the Queen's hounds, was accidentally headed in the middle of the deep cut railway bridge, at Frimley, and immediately leaped the parapet to the line beneath; but as the height was full eighty feet, it was killed by the fall. On two occasions a stag belonging to Sir Edward Deering, leaped the cliff at Dover to the eastward of the castle: on the first occasion it was unhurt, but on the second it was so much injured that it was necessarily destroyed. Its object was doubtless to get to the water, for on previous occasions deer belonging to the same establishment have run twenty miles straight to the sea, and having swam out, have been taken by boats launched after them. At Killarney such a result to the chase is always looked for.

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It is recorded by our circumnavigators, that, on touching at any new or totally unfrequented spot, the different animals, and particularly the birds, exhibited no alarm at their presence. This subject has frequently intruded itself upon me, when connecting the passage, "and the fear of you and the dread of you, shall be upon every beast of the earth, and upon every fowl of the air," &c., with the instinctive dread displayed by the young of all animals at the first appearance of man to them. It appears reasonable to us that the young of wild animals should exhibit this terror, whether as natural to them, or imparted to them by their dam, for they distinguish readily their different cries, either of alarm or of encouragement; but with the domestic animals, which are familiar with the human form, and show no fear at its presence, it is highly singular that the same dread should prevail with their young as with those of wild animals. With the latter, it is never extinguished; but with the former time and kindness efface it. The young half-fledged bird will throw itself from its nest rather than submit to be touched, and a mere look at it produces a visible alarm. The young of the partridge and lapwing will flee away for concealment, with a portion of the egg-shell attached to them; and the young wild duck will dive, and not unfequently drown itself, in its efforts to escape. The young hare cowers beneath the tall grass or heather, and the little harvest-mouse vanishes almost at the appearance of a shadow. Descending in the animal kingdom to the smallest insect the same fear prevails; and while time endures, the "dread" established by Divine ordinance will remain unaltered in effect and force. But hunger and the ecstacy of fear will cause a temporary abatement of this prescribed law, which, being momentary and superior in their effects, crush down the otherwise ascendant principle. The Bengal tiger has been known to crouch into the interior of an Indian hut, in a paroxysm of fear, to seek shelter from the conflict of the elements during one of the awful storms which occasionally occur in the East. Animals of the chace have taken refuge from their pursuers in the interior of houses; and birds, pursued by hawks, have not only flown into open windows, but have sought for refuge on the persons of individuals. In these and numerous other instances, the animal acknowledges the superior law of the dominion of man, and by a wonderful instinct feels that the fear of him is shared with every other creature, and seeks a momentary shelter in his presence from that danger which it alone can dispel.

As regards hunger, the subjection it occasions does not include carnivorous animals, which only become more daring, though it humbles them when in confinement; but its effects, if not lasting, are powerfully exhibited by the other classes, and by all birds, excepting again the rapacious kinds. In the severe winter of 1827, a famished sea-eagle (*Falco ossifragus*) attacked a market woman in the neighbourhood of Dover, who only escaped from her danger by throwing her cloak over the bird, which was thus disabled and secured.

London:
Printed by Stewart and Murray,
Old Bailey.

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